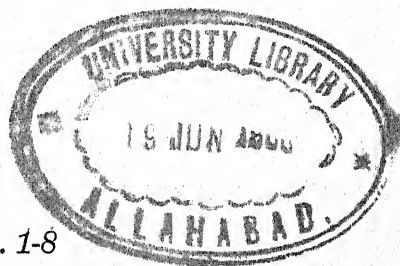


Cultivation of Bulbous Plants in India

*(Published under the auspices of the Mysore Horticultural
Society)*

BY

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PREFACE

Bulbs furnish a large number of ornamental plants, many of which are remarkable for the beauty of their flowers or foliage or both. A majority of them are very hardy and can easily be cultivated; yet, we find, they are most neglected in Indian gardens. The reason may not be far to seek; it may be due to a want of proper appreciation of their value or the lack of available information with respect to their culture and use. This booklet is to introduce these plants to amateur gardeners and furnish them with the necessary information in respect of them.

Much of the matter contained in these pages has already appeared in "The Hindu." The appreciation of these contributions by the plant-loving public has emboldened me to publish the same matter with some additions in a book form. I have further been encouraged by the Executive Committee of The Mysore Horticultural Society who have approved the manuscript and have kindly allowed me to publish it under the auspices of the Society. My object in writing this book would be fulfilled if I succeed in making this useful and interesting class of plants more popular than what they are at present and in clearing some of the practical difficulties in growing them.

I have found the notes on the respective plants in Nicolson's *Encyclopedia of Gardening*, *Standard Cyclopaedia of Horticulture*, William Watson's *The Gardener's Assistant* and *Bulb Growing for Amateurs* by H. H. Thomas very useful. I have obtained much useful

information from several of my co-members of the Society and the Lalbagh staff to all of whom my thanks are due. I am indebted to Mr. B. S. Shamanna, B.Sc., of The Central College, Bangalore, who very kindly drew the illustrations for me, and to the Proprietors of "The Hindu" for making the line and half-tone blocks.

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INTRODUCTION

What is a true Bulb ?

A bulb, in the strict botanical sense, is a modified underground stem, very much like an enlarged bud, emitting roots from its base and consisting mainly of modified leaves or scales, which are more or less fleshy

in nature and are folded round a solid thin conical axis. Figure 1 is the bulb of an Amaryllis. Figure 2 is a cross section of the same bulb showing the leaves surrounding the central portion. Figure 3 is a longitudinal section of a Hyacinth bulb. There are two types of bulbs, called the tunicated and the imbricated or the scaly bulbs, respectively. In the former, examples of which are Hyacinth,

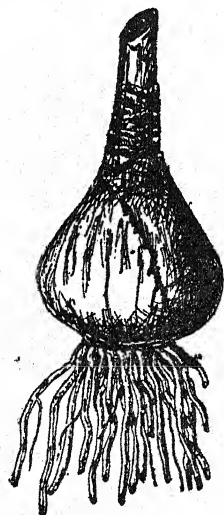


Fig. 1. Bulb of an Amaryllis.

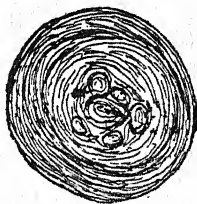


Fig. 2. Cross Section of an Amaryllis bulb.

Amaryllis and the common Onion, the layers of modified leaves sheath round a thin solid stem continuously like a tunic and hence such bulbs are called tunicated bulbs. In the latter type of bulb, the modified leaves are comparatively thick, narrow, small

scales overlapping each other like tiles on a roof. *Lilium*, figure 4, is a good example of an imbricated

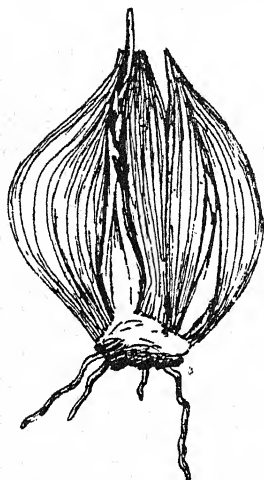


Fig. 3. Longitudinal Section of a *Hyacinthus* bulb.

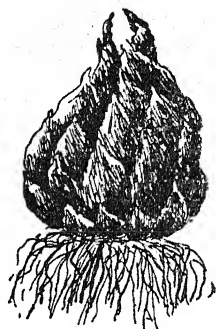


Fig. 4. Scaly bulb of *Lilium*.

bulb. In the interior of both these kinds of bulbs are situated the dormant parts of stem and flowers.

Meaning of "Bulbous Plant" in Horticulture

The term bulbous plant is used generally in horticulture to include such botanically distinct sections of plants as those bearing corms, tubers, rhizomes, pips, and fascicled roots. In the following pages, the word bulb and the term bulbous plant are used in this sense.

Corms are underground modified stems; they are usually rounded or flattened and they are somewhat similar to bulbs but their scales are few, membranous

and deciduous. The axis of a corm is very much thicker and larger than that of a bulb. A cross section of a corm will reveal a solid inner structure having neither scales nor fleshy layers as in a bulb. Corms, like bulbs, root from their base and produce every year



Fig. 5. 1. New corm of *Amorphophallus*. 2. Old corm.

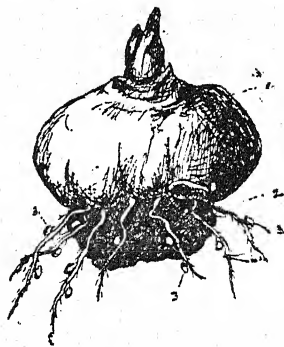


Fig. 6. *Gladiolus*. 1. New corm. 2. Old corm. 3. Cormlets or spawns.

a new corm or several of them, on the top of the old one which gradually dies away. Figure 5 shows a new corm of *Amorphophallus* (Canarese: *Surnagedde*. Tamil: *Karanakilangu*) growing on an old one. On lifting the corm of a *Gladiolus* from the ground, several small complete corms will be found under the base mixed with the roots. These are called 'spawns' and they vary in size from a pea to a gooseberry. The spawns are useful for propagation. Grown separately, they mature in about three years. Figure 6 shows the corm of a *Gladiolus* with its cormlets and roots.

Tubers.—Tubers are also modified subterranean stems; they consist of a fleshy roundish mass with

buds from which new plants are produced. The tubers bear upon their surface very small scales, which are

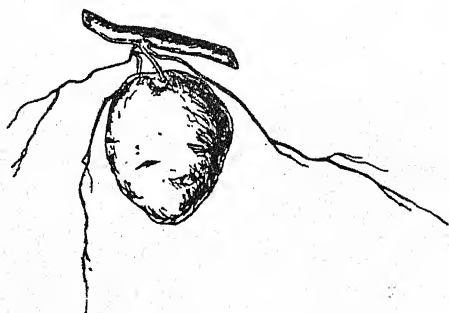


Fig. 7. Tuber of a Potato.

modified leaves, and from the axils of these scale-like leaves are produced buds which develop into new growth. Figure 7 shows how a tuber is formed from

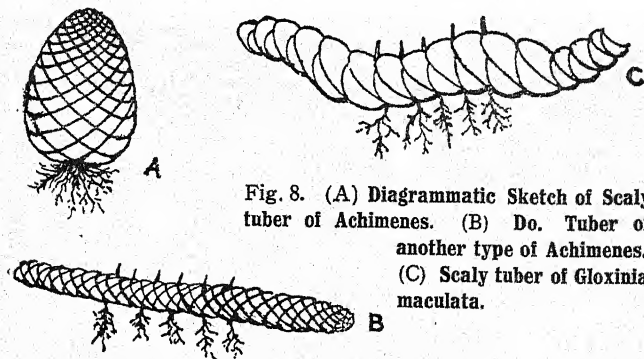


Fig. 8. (A) Diagrammatic Sketch of Scaly tuber of *Achimenes*. (B) Do. Tuber of another type of *Achimenes*. (C) Scaly tuber of *Gloxinia maculata*.

an underground branch of a Potato plant. Some tubers, there are however, which are scaly and long, looking

like worms or caterpillars. *Achimenes* and *Gloxinia maculata* have such tubers as will be seen from figure 8.

Rhizomes.—Rhizomes are also underground stems of horizontal growth, bearing roots below and shoots above. They are usually longer than but not so fleshy as tubers. Figure 9 is the rhizome of a *Canna* with its

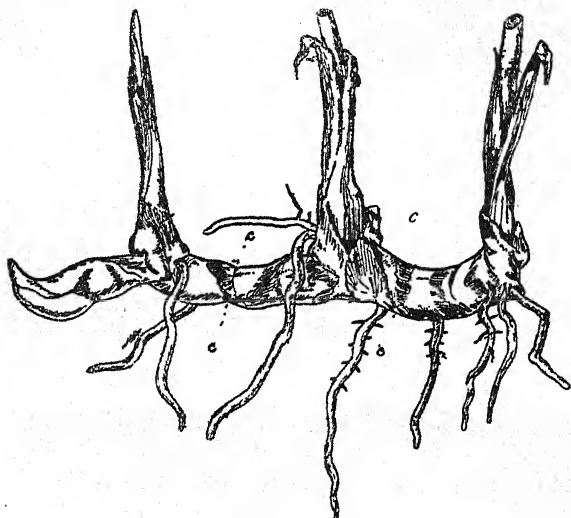
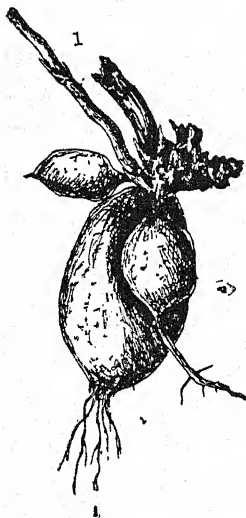


Fig. 9. Rhizome of *Canna*. The dotted lines c—c show where the root may be cut for propagating.

roots and aerial shoots. *Canna* and other rhizomes are called roots by some writers.

The Lily of the Valley, a popular English plant, which can be grown only in hill stations in India, is an example of a **Pip** or a **Flowering Crown**. *Paeonies* and *Ranunculus* have **Fascicled roots**, that is, bundles of closely arranged fleshy roots connected to a short

stem. The Dahlia has fleshy roots in which nourishment for the production of the annual or seasonal stems and flowers is stored; and these roots are connected to a crown bearing a number of buds or eyes. The root of a Dahlia will not grow into a plant like a Potato, unless a portion of the stem bearing a live bud is attached to it. Hence, a Dahlia is not a tuber in the sense that the Potato is. It is only a fleshy root which is attached to a crown or shoot, bearing buds. Figure 10 shows a clump of Dahlia roots attached to the stem.



Storage of Nourishment in Bulbs

A common feature of all the above-mentioned forms of subterranean stems is that they are in possession of a store of nourishment formed by the activity of previous year's growth. This store of nourishment enables them to produce leaves, stems and flowers during the next growing season. This fact is fully taken advantage of in the culture of bulbs in fibre in temperate climates for indoor decoration. The bulbs are placed in bowls in moist fibre; roots are formed soon from their base and these are followed by blooms and foliage though the roots do not get anything by way of food from the moist fibre. It is evident that the growth of the plant

Fig. 10. Fleshy roots of
Dhalia.

is sustained by the store of food contained in the bulbs. They get very much exhausted by the severe strain caused on them when forced to bloom in the above manner and they may perish if not well taken care of after blooming without recuperating their lost energy.

Three Stages in the Growth of Bulbous-rooted Plants

There is an element of the mysterious in all bulbous plants and this is especially so with the true bulbs. They blossom suddenly throwing out their flower-stalks from under the ground, fade, and return underground when the plant has lost its beauty. Generally speaking, there are three stages in the growth of all perennial bulbous-rooted plants. They are:—(a) *The blooming period.* After the period of rest—this varies with the several kinds of bulbs and their species—bulbs become active and produce flowers, stimulated by atmospheric conditions and supply of water. But, in several kinds, as for instance, *Gladiolus*, foliage and shoots are produced before flowers. In *Hæmanthus*, flowers are produced before foliage. The nourishment and the energy required for making these growths of flowers or foliage from the dormant buds are supplied by the food material stored in the respective bulbs. (b) *The growing period.* As the flowers fade, the leaves come up and the plant grows. The new roots, formed at the base of the bulb, convey water and salts from the soil, and the food that is manufactured by the plant is utilised partly for its immediate needs such as the formation of more foliage or flowers and partly for storing in the bulb down below in the soil, for future use when the bulb renews its growth next season. The true bulbs may increase in size till they subdivide; they also produce offsets, which are complete small bulbs attached to the old ones; they

can be pulled off the old bulbs and grown separately. Figure 11 shows a clump of *Polyanthes tuberosa* (Tamil

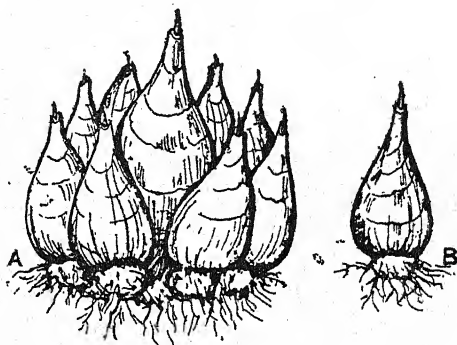


Fig. 11. (A) Large bulb of *Polyanthes tuberosa* with its offsets.
(B) An offset separated from the parent bulb.

and Canarese : *Sughandaraja*) with the old bulb surrounded by its youngsters. But, corms exist for a season only; during the period of growth of the plant, the place of the old corm is taken up by younger ones formed with the aid of the reserve food in the old parent corm and the food manufactured by the leaves. (c) *The resting period.* After the plants have stored up nourishment in their underground parts, they go to rest. The leaves gradually turn yellow and wither away, the sap going down to strengthen the bulb. To all outward appearance, the plant dies. But, the bulb lives within the ground and goes into a temporary but long enough sleep extending over several weeks. In fact, the bulb contains a new plant, which is protected and preserved by the reserve food and energy stored therein; this enables the dormant bulb to live through a long period of rest. It is during this period that bulbs are collected, stored and shipped by dealers just like so many potatoes. *Lilium*, tuberous-

rooted Begonia, Caladium, Dahlia and all such bulbs are imported during their period of rest and are grown in proper season. There are some bulbous plants such as Heliconia, some varieties of Alpinia, Agapanthus, Eucharis, and several species of Maranta, which are evergreen; that is, they do not shed their leaves like the majority of bulbous-rooted plants. Though they have not a well-defined period of rest, they suffer from a sort of lacklustre appearance and cease active growth during a certain part of the year, which is generally from November to March; these plants may be deemed to be resting then. Though water should not be completely withheld from them then, the supply of water should be reduced as there is no need for much water as no growth is made.

Uses of Bulbous Plants

Most bulbous plants are hardy and easy to cultivate. Several of them do not need more than ordinary care after they are once planted in the ground and established. There are some bulbous plants which are popular on account of their flowers. There are others, which are noted for their attractive foliage. There are, again, some which combine in them the beauty of both flowers and foliage. There are several bulbous plants as the potato which are useful as food stuffs, but this class of plants is excluded from consideration in this booklet which is solely devoted to ornamental plants. There is such a variety of bulbous plants, presenting a wide range in their habits of growth, size, form and colour of blooms that it is not difficult to choose from them plants suited for the several purposes and situations in the garden. Plants like Gladiolus and Iris are grown for their flowers for cutting. Cannas are unrivalled for producing mass effect in large beds on

lawns. Tuberous-rooted Begonias, Achimenes, Gloxinias, Dahlias, etc., are extremely useful pot-plants. For borders too, bulbous plants supply quite a large number of specimens. Amaryllis, Agapanthus, Dahlia, Tuberose, Gladiolus, Hedychium and Crinum are some of those which are suited for this purpose. For hanging baskets, Freesia, Achimenes, the hanging types of tuberous-rooted Begonia are eminently suitable. For planting on lawns, Cooperanthes and Zephyranthes are excellently suited. They form colonies of themselves and brighten the green stretch of lawn.

Season for planting "Bulbs"

The time for planting bulbs is determined by the season in which they usually flower. In England and such other temperate countries, there are four well-defined seasons—Spring, Summer, Autumn and Winter. Bulbs generally fall into three classes, those which are planted in spring, those which are planted in summer and those which are planted in autumn. Anemone, Cyclamen, Crocus, Hyacinthus, Iris (some species of), Ixia, Lilium, Montbretia (Tritonia), Narcissus, Oxalis, Ranunculus, and Tulip are among those which are planted in autumn. In summer, Amaryllis, Begonia, Cyclamen, Dahlia, etc., are planted. Gladiolus, Iris, Lilium, Montbretia, Tigridia, and Zephyranthes are among those planted in spring.

In India, for all practical purposes, we have only two seasons, the hot and the cold seasons. Here, bulbous plants may generally be grouped to fall under one of two classes:—(a) those which flower from February to April and (b) those which flower from July to October. The former group is planted in January and February and the latter group from May to July. Hippeastrum

(Amaryllis), Freesia, Crinum, Clivia, etc., flower in the months of February-April and they should be started early in January. Dahlia, Achimenes, tuberous Begonia, Gladiolus, etc., bloom from August to October. Dahlias are planted in the middle of May; Achimenes, in the middle of April; Gladiolii, about the end of May and so on.

India is a continent by itself. The time for planting bulbs in the plains differs from that at high elevations. Dahlia, for instance, is planted about the middle of May and it finishes flowering by the end of October, in Bangalore. In Madras, October is the time to plant them. Hence, it is clear that the same kind of bulbs have to be planted in different places at different times according to their natural blooming period.

Bulbs to grow on the Hills

There are several types of bulbs which can be grown successfully only at high elevations, that is, 4000 feet and above the sea level. Anemone, Belladonna Lilies, Crocus, Daffodil, Hyacinth, Clivia, particular species of Gesnera, several species of Iris, Isoloma (Tydæa), Ixia, Kniphofia, Lilium, Montbretia, Narcissus, Ranunculus, Saxifraga, Watsonia, Tulip, Tigridia and Sprekia can only be grown at elevations higher than 4000 feet, some thriving at greater heights than others. In the plain country, there is no chance for growing the above kinds at all. At medium elevations, say from 2500 to 4000 feet, some imported bulbs as Anemones and Ranunculus and tuberous Begonias can be grown for a season or two, but the bulbs perish after blooming one or two years. The profusion and perfection of bloom too are far from satisfactory. It may generally be observed that all bulbs which thrive and bloom to perfection on

the hill stations may not be grown successfully at medium and low elevations; but, all those bulbs which can be successfully grown at low elevations will thrive at medium to high elevations.

The time of flowering of particular bulbous plants in England generally corresponds with that on hill stations in India and hence, the time for planting the several kinds of bulbs mentioned in English books is generally applicable to planting them on the hills here. Those bulbs as Tulip, Crocus, Narcissus, Hyacinth, etc., which are reputed to be suited for bedding in English books can be tried with some degree of success only on the hill stations in India. The "Spring-Flowering Bulbs" should be planted in December—January. In places free from frost, the planting can be done earlier in October. Some such bulbs as Anemone, Crocus, Hyacinth, Ranunculus, Scilla, and Tulip may be planted early and Gladiolus, Iris, Narcissus, etc., may be planted later in February—April.

Bulbs for Growing at Medium Elevations

The following plants can be grown with a fair degree of success from 2500 to 4000 feet also, though most of them do best only on hill stations:—*Achimenes*, *Agapanthus*, *Arisæma*, *Belamcanda*, *Calla*, *Clivia*, *Costus*, *Cyclamen*, *Freesia*, *Gesnera*, *Gladiolus*, *Gloxinia* hybrids, some species of *Iris*, some kinds of *Lilium*, and *Montbretia*.

Bulbs for Growing in the Plains

The following bulbs can be grown at low elevations:—Some hardy varieties of *Achimenes*, *Amaryllis* (the ordinary kinds with red and white colours), *Canna*, *Crinum*, *Alpinia*, *Costus*, *Caladium*, *Alocasia*, *Colocasia*, *Dahlia*, *Eucharis*, *Eurycles*, *Gladiolus*, *Gloriosa*, *Hæman-*

thus, *Hemerocallis*, *Hedychium*, *Kämpferia*, *Mirabilis*, *Oxalis*, *Pancratium*, *Polyantes tuberosa*, *Zephyranthes*, *Heliconia*, and *Maranta*.

General Method of Cultivation of Bulbus-plants

After the resting period, bulbs are taken out of the place where they were stored and placed in sand which is kept moist. The dormant buds soon swell and begin to grow. After the desired growth is made by the buds, the bulbs are either potted or planted out in the ground, as the case may be.

The ground should be prepared at least a fortnight ahead of planting. It should be dug up to eighteen inches at least or more in the case of deep-rooting kinds as *Canna*. Manure in a thoroughly decomposed condition and leaf mould should be well incorporated into the soil nearly nine inches to a foot from the surface. Most bulbs abhor fresh manure to come into contact with them. The soil best suited for most bulbous plants is porous sandy loam containing a large quantity of leaf mould. A little manure may be added to enrich the soil. Efficient drainage of the soil should be ensured in the cultivation of all bulbous plants. If the soil is heavy, it should be lightened by working in sand around the spots where the bulbs are to be planted.

The depth at which bulbs should be planted varies with the several kinds. Most bulbs which thrive at low elevations, such as *Haemanthus* and *Amaryllis*, are planted leaving the growing tip or crown just showing above the soil. On the hills, *Hyacinths*, *Tulips* and large sized bulbs, are planted generally their own depth below the soil but if frost is likely to damage them, they are planted one or two inches deeper still.

Gladiolus is planted at least two inches below the soil. Small bulbs may be covered with an inch of soil above them, and large ones with about three inches of soil. The depth of planting *Liliums* varies with the species. Some Lilies, such as *L. tigrinum* and *L. speciosum*, throw out roots from the stem above the bulbs in addition to those which are produced below the bulbs and this type of bulb should be planted sufficiently deep to encourage the formation of the upper set of roots also; four to six inches of soil above the bulbs may be quite necessary. The non-stem-rooting Lilies may be planted two to three inches below the ground according to their size, larger bulbs requiring to be buried deeper than small ones. *Lilium longiflorum* is planted two to two and half inches deep.

Bulbs should be planted early in the season. This allows a long period of growth for the plants which ensures large blooms, prolonged blooming, and healthy strong bulbs, whereas late planting and forcing, result in weak and short-lived blooms and bulbs.

To facilitate rooting and to prevent rot, it is advisable

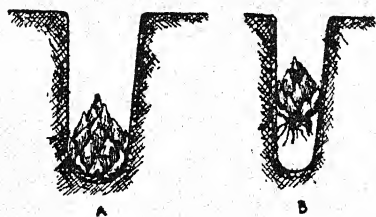


Fig. 12. (A) Bulb correctly planted in hole made with trowel. (B) Bulb badly planted, without resting on soil, in hole made with dibber.

to put some sand under and around the bulbs while planting. A hole is made for the reception of the bulb in the soil, a handful of sand is put into the hole, the bulb is placed on it and again some sand is put above the bulb

and around it. It is always safer to use a trowel than

a dibber for making the hole ; if a dibber is used, a deep but not wide enough hole is made with the result that the bulb gets fixed up as shown in figure 12 (B) without any soil under it and it rots and dies in course of time.

Watering should be sparingly done from the time the bulbs are planted till they are established and have formed roots and are growing. As more and more growth is made by the plants, the supply of water is gradually increased.

The plants should be suitably staked to prevent shoots and blooms from being blown over. Staking should be done promptly. Gladioli, unless staked from the very start, when the shoots are 6 inches tall, result in distorted spikes and stems. The correct mode of tying the plant is by passing one end of the thread round the shoot once and then crossing the ends forming a loop and taking them round the stake and tying them, thus describing a figure 8 of thread, one loop holding the shoot and the other the stake. The wrong way of tying is to fasten the shoot directly to the stake, which does not allow sufficient room for the development of the shoot and results in injury to it.

Liquid manure is applied with great advantage when plants are actively growing. Vigorous growth, sturdy shoots, large and colourful blooms, prolonged blooming period and good strong bulbs for the next season are the benefits derived by judicious use of liquid manures. They are quick in action and are to be applied frequently, say once in ten days, in weak doses. Strong solutions do more harm than good. In the case of such voracious and hardy plants as Cannas and Dahlias, liquid manure prepared from oil-cakes or fertilizers as ammonium phosphate or a mixture of superphosphate and ammonium

sulphate in equal proportions may be used. Two ounces of ammonium phosphate or the mixture may be dissolved in two gallons of water. The soil should be first moistened and then the liquid manure applied. For tender plants as tuberous Begonias, Cyclamens, Gloxinias, it is safer to use liquid manure prepared from cow-dung in the following manner: Half a basket of fresh cow-dung is put into a tub containing about 10 gallons of water and stirred well. A more agreeable method would be to tie up the dung in a gunny bag or piece of cloth and suspend it in water. After three or four days, the liquid is further diluted with water till it acquires the colour of light tea-decoction and used. After each application of liquid manure, the surface of the soil should be stirred to a depth of about an inch.

When the growing season is coming to a close, the plants cease to grow; the foliage begins to turn yellow and soon the seasonal shoots and the leaves gradually dry up. Watering should be gradually reduced when the plants show change of colour in the foliage and discontinued when the leaves have withered away. The leaves and shoots should be allowed to dry up gradually. They should not be cut away to store the bulbs in a hurry. By doing so, a large amount of food, which the bulbs would get from them, would be denied to them and they may be so weak that they may perish during the resting period.

Some bulbs, after they are planted in the ground, may be allowed to remain undisturbed for several years if they are spaced reasonable distances apart providing for their development. Crinum, Pancratium and such other kinds are best when left in their places for several years. But, there are some, which require to be taken out every year. There are others which can be

allowed to remain in their places for two or three years. Among those bulbs which should be lifted every year from the soil are *Gladiolus*, *Hyacinth*, *Ixia*, *Ranunculus*, *Anemone*, and *Dahlia*. In the words of Thomas, the author of *Bulbs and How to Grow Them*, the advantages of lifting are described as follows :—

“The object of lifting is a three-fold one. First of all, it enables certain bulbs which do not ripen satisfactorily in the soil to be well ripened by exposure to the air and storage in a dry atmosphere. Secondly, it enables the site they occupy to be planted with other plants for a portion of the year; and thirdly, it affords an opportunity of separating the mature flowering-sized bulbs from the non-flowering offsets, and so make sure of having colonies of bulbs uniform in the number and quality of their flowers.”

Care to be taken of Bulbs in Borders

Such bulbs which do not require to be taken out every year have to be preferred to others for planting in borders. In India, *Crinum*, *Amarylli*, *Pancratiun*, *Tuberose*, *Hemerocallis*, *Haemanthus* and such others are useful for this purpose. Each kind of bulb is planted in groups here and there, due attention being given to its individual requirements of sunshine or shade. Tall growing plants are put in the back; medium-sized plants in the middle and dwarf kinds are planted edging the latter. It is quite necessary to mark out the spaces occupied by bulbous plants, lest the *mali* should injure the bulbs when they are at rest during hoeing and weeding operations. Some well-decomposed cow or horse manure is forked into the soil around the bulbs every year.

Planting of Bulbs on Lawns ("grassland")

There are several hardy bulbs which can be used to adorn the lawn, grassy slopes, and banks, brightening them with masses of colour here and there. In England, the spring flowering bulbs such as Daffodils, Crocus, Grape Hyacinths, Snowdrops, Fritillarias and some varieties of Tulips are used for "naturalising in grass." These cannot be grown in India, except on high hill stations. Varieties of Zephyranthes (Thunder Lilies), Cooperanthes, which are bulbs allied to Zephyranthes, and Amaryllis, are the kinds which thrive in grass land at low and medium elevations up to 4,000 feet. Planted in fairly capacious holes, say 9 to 12 inches deep and 3 to 6 inches wide, filled in with rich soil, the bulbs soon form colonies by self-sown seedlings and increase by offsets.

Propagation of Bulbous Plants

From seed.—A great many bulbous plants can be easily raised from seed. But, in most cases, it takes three to five years for the plants to bloom. Amaryllis takes about 4 years; Lilium, 5 to 6 years, Gladiolus, 3 years. It may not be convenient to grow bulbs from seed, on account of the long time taken for the bulbs to mature and bloom. Bulbs are hence got out whenever required from bulb-growing centres as Holland or firms dealing in them. But, it must be admitted that cultivation of plants from seed has a fascination all its own. Plants raised from seed very often do not come true to their parent plants and there is thus always the possibility of new and choice varieties being obtained. New varieties can be successfully raised from seed by careful hybridization, cross pollination and selection.

The seeds collected should be ripe. Those of some bulbs as *Amaryllis* should be sown fresh when they are ripe. The compost for sowing seed should be open and light and it is generally made up of equal parts of loam or old soil, leaf-mould, and sand. Seeds, if they are fairly large, can be sown in well-prepared nursery beds.

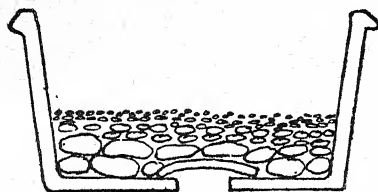


Fig. 13. Seed-pan with draining material.

If they are small, they are better sown in seed-pans—these are shallow pots. Figure 13 shows a seed-pan filled with crocks for drainage. For draining the soil in the pot to prevent stagnation of

water at the roots a concave piece of crock is placed against the drainhole with its concave side facing downwards. A few more pieces of crock are placed above this. The crocks should be washed free from soil sticking to them. The crocks are then covered over with a layer of rough soil siftings or coarse sand to prevent fine soil washing down into the drainage and sealing it up.

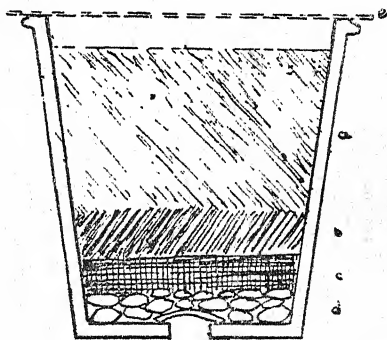


Fig. 14. A well-drained pot, Figure 13 prepared for sowing seeds.

- (a) fine soil.
- (b) coarse soil.
- (c) rough fibre or moss.
- (d) drainage material, crocks.
- (e) sheet of glass.

Figure 14 shows how a pot is drained and filled

with medium for sowing seeds. In place of sand, cocoanut fibre, moss or half-decayed litter may also be used to prevent soil from washing down into the drainage material. The seed-pans should be filled up to about half an inch from the surface. The top layer of soil should be fine, sifted and freed from small stones, etc. The soil should then be gently firmed with the palm of the hand or with a piece of plank, levelled, and watered with a water-can fitted with a fine rose. Large seeds should be placed on the soil and covered over with about quarter of an inch of fine soil. Small seeds may require only one-eighth inch or less of fine soil to cover them. After sowing, watering should be done again with the fine-rosed can, so that the surface of soil may not be disturbed or made uneven by the force of water. If the seeds are very small or minute, as in the case of tuberous-rooted Begonias, Gloxinias, etc., they should be "bulked," that is, mixed with four to eight times their volume of fine sand and sown thinly over the soil; the fine seeds are not covered with soil usually but a very thin film of fine sand over them may be advantageous. Where minute seeds are concerned, it is not wise to water the soil from above even with a fine rose; watering should be done from below through the drainage hole by allowing the pan to stand in a larger pot or pan containing water, taking care that the level of the water in the receptacle is not above the level of soil in the seed-pan put into it. The water rises through the soil by capillary force and the soil is uniformly moistened through. After watering is over, the pan should be removed to a shady place and covered over with a sheet of glass. It retards quick evaporation from the soil and conduces to uniform germination.

The plate of glass should be removed when germination is complete. The soil should, at no time, be allowed to get dry but should be maintained agreeably moist being watered in the manner recommended above. The seedlings in the pan should be admitted morning sun. Seedlings of most bulbous plants may be allowed to remain in the same pan without transplanting for a year. But in some kinds as Begonias, the seedlings should be "pricked" (that is, transplanted with care one to two inches apart) into fine richer soil in well-drained seedpans or boxes and when they are growing well and becoming overcrowded by touching each other, they should be potted individually in small 2 to 3-inch pots; and when these pots are filled with roots, the young plants are shifted to larger¹ pots. If the sowing is thick or the seedlings are allowed to overcrowd each other, they damp off. At the end of the growing period, the seedlings have formed small bulbs which go to rest. Water should then be withheld from the pans or pots, as the case may be, till next planting time. The young bulbs are potted either singly or three to five in a pot according to the variety and size of bulb and the size of the pot and grown carefully, the treatment being the same as that indicated for mature bulbs. After 2 to 5 years of culture the bulbs mature and bloom to perfection.

By offsets.—It has been noticed how mature bulbs give rise to smaller complete bulbs called offsets around them. Figure 11 shows a large bulb of Tuberose with its offsets. These offsets when separated and grown with care mature, eventually flowering in 2 to 4 years. Offsets are best separated from the parent bulb at the time of repotting or replanting.

By formation of new tubers in the case of tuberous-rooted plants.—Achimenes increase on a large scale by

formation of a mass of new tiny scaly tubers at the tips of the roots of the old tuber. Each of these tubers is capable of giving rise to one or more plants. *Gloxinia maculata* also increases prodigiously in the same way. Potatoes increase similarly. Potato tubers or bits of them containing these eyes are capable of producing individual plants.

By spawns.—The formation of spawns has been explained while dealing with corms. Spawns may be sown like seeds, taking 2 to 3 years to grow into mature corms. They are separated when the corms are stored and preserved in sand and sown in seed-pans at the commencement of the growing period.

Division of bulb or tuber or corm.—Sometimes more buds than one might be noticed on a single bulb, tuber or corm. The bulb may be cut through into as many bits as there are buds and the pieces potted separately. The cut surfaces should be dusted with lime or sulphur to prevent destruction by rot or fungus attacks. *Caladiums* are usually increased in this way. So also *Amorphophallus*, a common Indian cormous rooted plant, the corms being used as vegetable.

By bulbils or aerial offsets.—Some varieties of *Lilium* produce in the axils of their leaves tiny complete bulbils. These drop off when they are ripe and readily push forth roots from their base. The bulbils are sown an inch deep and taken care of and treated like seedling plants. In 4 to 6 years, they mature and produce blooms.

By scales taken from bulbs.—Most Lilies may be increased by scales taken from the bulbs. The scales are pulled from near the base of the mature bulbs and immersed in sand with their inner side into the moist

soil. At the base of these scaly leaves, are produced small bulblets, which when mature, produce flowers.

By stem cuttings.—Some plants as *Dahlia* can be increased by stem-cuttings. The cutting should have no hollow core. The best method of securing satisfactory cuttings of *Dahlias* would be to place the clump of tuberous roots in moist sand and allow shoots to come up from the dormant buds. These may be cut close to the fleshy roots and rooted as cuttings. In course of time, the cuttings form tiny bulbs which go to rest. These bulbs may be started like mature bulbs and they produce quite satisfactory flowers. *Achimenes* may be increased by using tips of shoots as cuttings.

By leaf-cuttings.—Bulbous plants of the *Gesnera* family are easily increased by leaf-cuttings. Neither too tender nor too old and spent leaves should be chosen for the purpose. The upper half of the leaf may be cut away and the leaf-stalk immersed in sand. In some cases, the leaf-stalk may be cut away and the base cut into the form of a wedge and immersed in sand. A small tuber is formed which will mature in due course.

The particular methods of propagation suitable for the respective bulbs are given under the respective cultural notes.

Cultivation of bulbous Plants in Pots

Bulbs are grown in pots in much the same way as other kinds of plants. But, particular care in watering when they are started and just growing and when they have finished blooming is necessary. Over-watering, when the bulb has not formed enough roots, will cause them to rot. Again, overwatering when they are about to rest, is very injurious for the same reason. The soil

for growing all bulbous plants should be open and porous. The compost for pot-culture of bulbous plants is usually made up of equal parts of red earth, sand, well-sifted leaf-mould, and well-decomposed horse manure. In hot places, cattle manure is preferred to horse manure. The pots should be well drained. The depth of planting of each bulb is given under the cultural notes. Liquid manure should be supplied in the manner already mentioned above. Due regard to

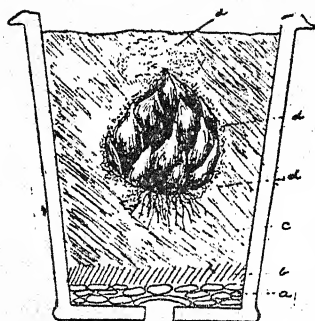


Fig. 15. Showing how a delicate bulb is planted.

- (a) crocks and draining material.
- (b) coarse fibre or moss or sand.
- (c) compost.
- (d) sand.

necessary staking should be had. How the pot is drained is described already and it becomes clear on a study of Figure 15, which shows also how the pot is filled with soil and the bulb planted. It is important that some sand is placed below the bulb and that some sand is sprinkled all round it. Some space should be left above the soil in the pot for the reception of water. For the manner of potting

several kinds of bulbs and their treatment, reference is invited to the accompanying cultural notes of the several plants.

Pests and Diseases

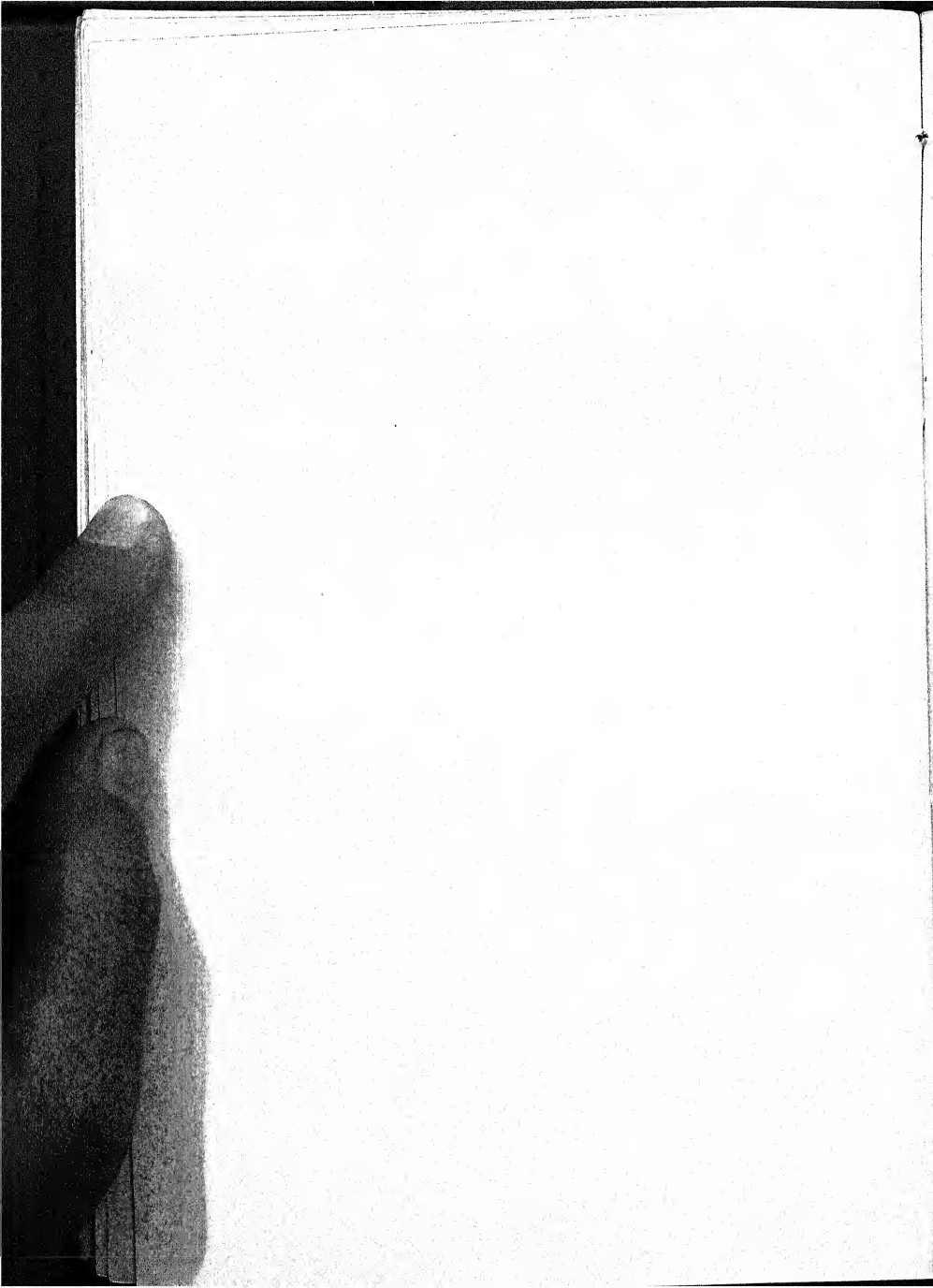
Like all other plants, bulbous plants are subject to attacks of insect pests and fungoid diseases. But, it must be admitted that they are comparatively free from

many pests which attack other plants. Among those insect pests which attack the root are the Cockchafer grub. This is very troublesome, devouring the tender roots. It gets introduced into the soil with the manure and is best picked out from the soil on careful occasional examination. Rats, mice and bandicoots are very fond of bulbs and one should not hesitate to employ traps or poisons to despatch them. Aphides or green fly—there are black and brown ones also—crowd round the shoots and buds sucking the sap and weakening them. Aphides are destroyed by spraying with fish-oil soap solution or nicotine decoction. Some times one finds mealy bugs on bulbous plants. These are best rubbed off or if the attack is severe, fish-soil soap is very useful. Caterpillars very often, especially with the approach of the south-west monsoon, attack the foliage and shoots of several bulbous plants as *Crinums*, causing much damage. They may be handpicked. If they are too many and unmanageable, lead arsenate solution may be sprayed on the plants. The compound acts as a stomach poison. In several localities, slugs and snails also cause appreciable harm. They are attracted to heaps of bran or some other stuff during night, collected and killed. If the soil is dusted freely with soot or lime in the evening, these insects are effectually kept away from the plants. There are several fungus pests attacking bulbs and once the bulbs are affected, they are best destroyed. If the soil is very contaminated, no bulbs should be grown in it for a year or two; it should be disinfected by digging in lime liberally.

In the following pages, are given cultural notes of select bulbous plants. List A deals with select bulbous plants grown for their flowers. List B deals with ornamental-leaved bulbous plants.



CULTURAL NOTES
ON SELECT
BULBOUS PLANTS GROWN
FOR THEIR FLOWERS



[The introductory remarks should be read with the following particular notes for complete information]

ACHIMENES

(Natural order. Gesneraceæ)

Achimenes are very beautiful free flowering plants growing 6 to 15 inches high bearing in late summer a constant succession of effective flowers. There is a great variety both in form and colour of the flowers. They are available in several shades of colour from brilliant scarlet to white and blue. Achimenes grow excellently well in pots, well-drained 10-inch pots being generally used. Planted in wire or hanging baskets lined with moss, some tubers also being put in so as to grow through the sides and the bottom too of the baskets, they are very effective. Hardier kinds can be grown on rockeries brightening them up here and there with patches of colour. Purple-flowered kinds can easily be grown in the plains and all varieties can be successfully grown above an altitude of 2000 feet.

The tubers are scaly, brittle and small. They are pear-shaped in the longiflora type which bears tubular long flowers. They are long and wormlike in the grandiflora type which bears flowers with more or less flattened limbs. Both these types of bulbs are diagrammatically shown in figure 8. The tubers are carefully

taken out after resting, without injuring them and started growth in the month of February or March at low and medium elevations and in April to May on the hill stations. They are placed in sandy soil in seed-pans an inch apart and covered over with fine soil to a depth of about quarter of an inch. The soil is kept just moist. When the shoots are about an inch high, the plants are carefully transplanted into 8 to 10-inch pots, placing them 2 to 3 inches apart. The pots are sheltered from strong sunshine. Water is sparingly supplied to the plants till they establish. When the plants are actively growing, watering is done liberally. It is to be done by the edge of the pot as it is not desirable for the leaves and flowers to come in contact with water. Care is taken that the plants are not exposed to rain and wind. When the stems are 4 to 6 inches long, their tips may be pinched off to induce the plants to bush out. Liquid manure prepared from cow-dung may be used with great advantage, once a week, when the plants are just forming flower buds. When the blooms are past, the supply of water is gradually reduced; when the plants die down, it is finally stopped. The pots with the tubers are turned on their sides and allowed to remain so in a cool dry place till next potting. The tubers may also be taken out of the soil and carefully preserved in sand.

Propagation is mainly done by the small scaly tubers which multiply themselves most prolifically; the tubers may be preserved year after year increasing in quantity

every year. Propagation can also be done by cuttings, the tips of stems about an inch long, being used for this purpose. At the base of the cuttings, small tubers are formed, which are rested and started growth in proper season. New varieties may be raised from seed. The seeds are very small and require to be bulked with fine sand and sown with care and very lightly covered with fine soil. The sowing is usually done a month or two earlier than the planting time for tubers.

AGAPANTHUS

(Natural order. Liliaceæ)

Agapanthus umbellatus, called by some, the Blue African Lily, is a native of the Cape of Good Hope region. It is one of the most beautiful bulbous plants, combining handsome evergreen foliage, consisting of gracefully arching strap-shaped thick numerous leaves which are two to three feet long, with very ornamental blooms, consisting of large umbels of flowers surmounting the foliage and produced on stalks about two feet high. The umbels contain about thirty funnel-shaped flowers, $1\frac{1}{2}$ to 2 inches long, these blowing in succession. The common species is *excelsa*, which is robust growing and bears blue flowers. The variety, *albus*, with its white flowers is very handsome. The dwarf variety, *Mooreana* and the variegated leaved kind, *variegatus*, are not yet introduced here. The bulbs are very strong rooting and require plenty of root space and they thrive

in light rich soil. Grown in tubs, in clumps, 4 to 6 of them being planted in a tub, *Agapanthus* makes a good show. For single bulbs, 8-inch pots, specially made 20 inches deep, should be chosen. At low elevations, blooming is not free. At high elevations, the bulbs can be planted in borders in groups. Semi-shade and plenty of water during active growing season from March to November are necessary. Once a week, liquid manure may be applied during this period. Flowers are usually borne in March—April. Propagated by offsets; can also be raised from seed.

ALLIUM

(Natural order. Liliaceæ)

There are some ornamental species of the common garlic (*Allium sativum*), which are grown for their pretty flowers, through their stem and leaves when bruised smell disagreeably. Most of them are only suited for growing from medium to high elevations. A *neopolitanum* grows about 15 inches high bearing large terminal clusters of white flowers. A *giganteum* bears pretty rose-purple heads of bloom, 3 to 4 inches in diameter. Five bulbs can be put into each 6-inch pot. When the leaves turn yellow, the bulbs may be taken up and tied by and suspended by their stalks in a dry airy room. Raised from the bulblets.

AMARYLLIS

(Natural order. Amaryllidaceæ)

The garden hybrids of *Hippeastrum* are popularly known as *Amaryllis* and they are dealt with under *Hippeastrum*.

Amaryllis Belladonna, commonly known as the Belladonna Lily is one of the most beautiful autumn flowering bulbous plants which thrive only on hill stations in India. Flowers are large, funnel-shaped, six to twelve of them being produced on a scape, about 2 feet tall. Well-drained light soil and warm position are necessary. The bulbs may be planted in the border 8 inches apart. The flowers of the common variety are rose-red in colour. There is also a variety with white flowers.

AMORPHOPHALLUS

(Natural order. Aroideæ)

Belongs to the Arum family. The edible species is known as *Karanai kilangu* in Tamil and *Surna gedde* in Canarese. The roots are cormous in nature and very large, requiring plenty of room to spread out. In the words of Woodrow, "*Amorphophallus Titanum* is a grand species for an islet in a pond; being a sort of *suran*, it has a large tuberous root which lies dormant in the dry season and produces a flower, then a single leaf, having an upright stalk and an umbrella-like head about 6 feet

high. Rich soil and abundant water is necessary." *A. bulbifer* is another handsome species. Propagated by cutting out the buds attached to a portion of the corm and starting them to growth.

ANEMONE (Wind-flower)

(Natural order. Ranunculaceæ)

A large genus of small growing plants, many of them being garden favourites bearing single or double flowers, resembling poppies or chrysanthemums. The oldest species which is also the best known and popular species is *A. coronaria*, the varieties of which are the Poppy Anemones. These are available in a wide range of colours. The species, *A. fulgens*, is also very pretty with bright scarlet flowers which are about two inches across.

Anemones can be successfully grown only from medium to high elevations. At high elevations, they are usefully planted in rock gardens. At medium elevations, they may be grown in pots for a season or two, after which the bulbs perish. They are grown from imported tubers which look dry and shrivelled up when they arrive. They are started growth in the month of October at medium elevations to flower in February and in March to bloom in July—August on hill stations. They can also be raised from seed which should be sown fresh after rubbing them with sand to free them from the fluff. Germination is very slow,

taking about a month. Grown carefully, the plants take about seven months to flower from seed.

The tubers should be planted two inches deep in six-inch pots. Good drainage should be ensured. The soil should be light and it may be made up of two parts each of sand and leaf-mould and one part each of red earth (red loam) and manure. Some sand should be placed under and above the tubers. During growth, liquid manure prepared from cow-dung should be liberally applied once a week. If this is not done, the tubers do not develop and do not produce good blooms next year. Partially shaded position is very desirable. When the foliage has dried up, the tubers should be lifted from the soil and preserved in sand till next season. Only well-grown plants furnish good tubers; weak ones are not worth keeping at all.

ARUM LILY

See under *Richardia*

BABIANA

(Natural order. Iridaceæ)

South African dwarf bulbous plants with plicate leaves like those of Iris and flowers like those of Ixia. Imported roots thrive well in cool places, but they do not thrive at low and medium elevations.

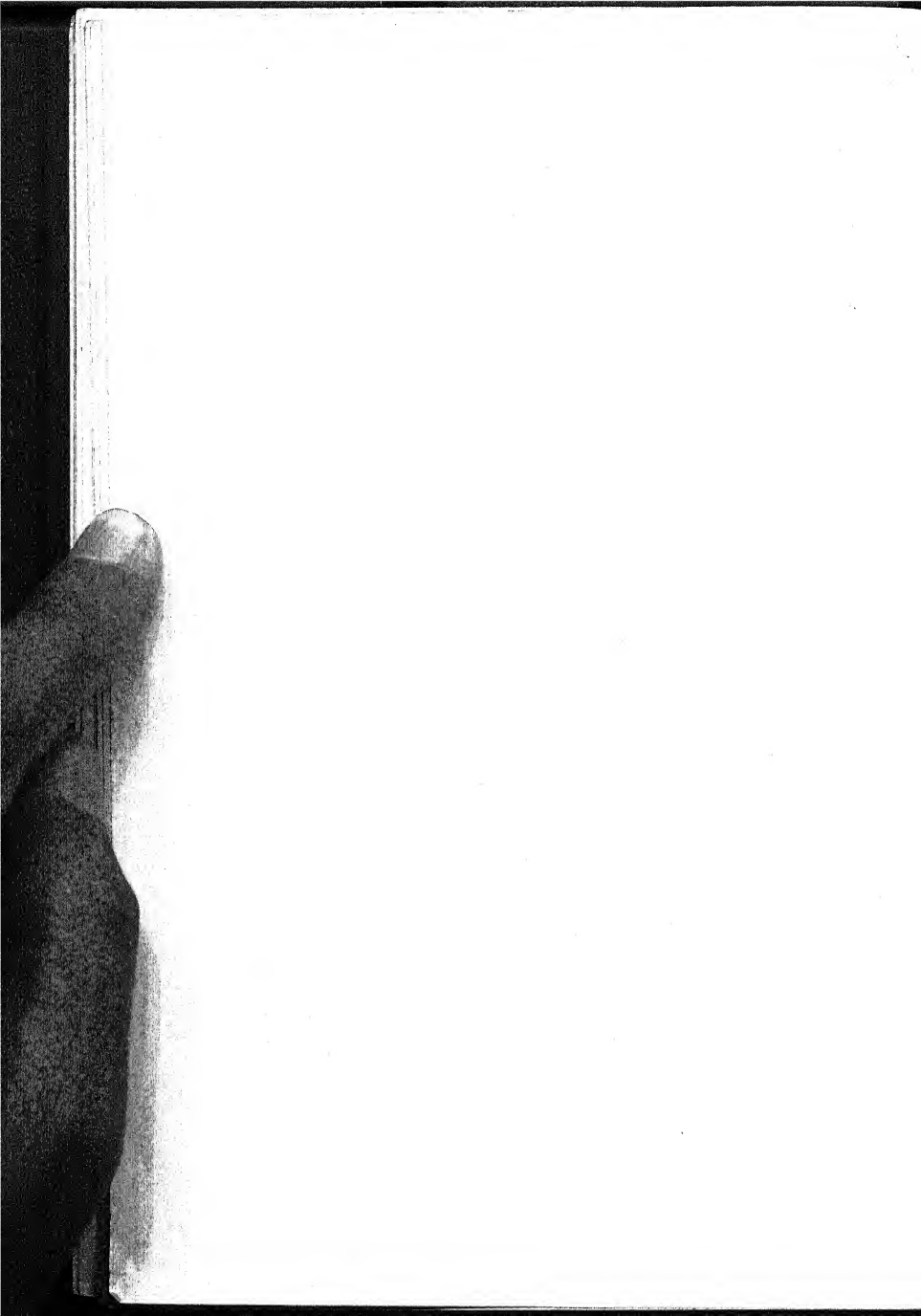
BEGONIA

(Natural order. Begoniaceæ)

The tuberous rooted section of Begonia contains universal garden favourites, which are derived from three or four species introduced from the Andes of Peru and Bolivia about 1870. They are extremely lovely plants with neat attractive foliage and large brilliantly coloured flowers. "Many magnificent shades of colour have been evolved by hybridization, selection and cross fertilization, and there are now several colours, varying from the purest whites through pink and purple to the deepest scarlet and crimson, while clear yellow, primrose and orange shades also abound. There are single and double flowered varieties, some with plain edges, others crisped and frilled, and others again with crests on the face of the petals." Some of the single flowers are nearly eight inches across and have a handsome orbicular form. The double flowers are also large and may measure four to six inches in diameter. They also vary in form, resembling Roses, Hollyhocks, Gardenias, Camellias and Carnations. The plants are dwarfs growing about a foot high with a rather stout fleshy stem, and they are cultivated in pots only in India, though in Holland and such other places they are also used for bedding. The *decumbens* type of tuberous Begonias have slender weak stems which hang down with their drooping flowers and hence, they are well suited for growing in hanging baskets. Begonias thrive only from medium to



Tuberous-rooted Begonias staged with Maidenhair Ferns
(By courtesy of Superintendent, Government Gardens, Bangalore)



high elevations. At medium elevations, the tubers perish after flowering one or two years.

Tuberous-rooted Begonias are usually grown from tubers imported from Holland, England and Germany. They are of the size of a small potato. They can be planted from February to May to get a succession of flowers. Tubers are placed in a layer of damp moss or sand and when they have sprouted about half an inch, they are potted in four-inch pots with the tips of the tubers just under the soil. The soil is made up of equal parts of well-sifted leaf-mould and sand, to which mixture may be added with advantage, some pieces of charcoal. Some sand is placed all round the tuber and the soil gently pressed with the fingers round the tubers. Watering is very sparingly done till the tubers establish in the new soil and begin to grow. The pots are removed to a shady situation and are admitted to only morning sun after they are established. When the small pots are filled with roots, the plants are shifted to 6 to 8-inch pots. in which they are to flower. The compost for this second potting is made up of equal parts of red earth, sand, leaf-mould and manure; charcoal pieces may be added to sweeten the soil. Liquid manure prepared from cow-dung is applied once a week when the plants are growing well, till they are fully in bloom. Plants with sturdy stems need no staking. But, weak-stemmed plants do need it. Shade from afternoon sun, and shelter from wind and rain are necessary. Under glass, they do better. When the flowers are

over, watering is reduced gradually; it is stopped when the leaves dry up. The tubers are then turned out of the pots and stored in sand or cocoanut fibre.

Tuberous Begonias are easily raised from seed. This, though a tedious method, is nevertheless very interesting and economical, as one can hope to raise as many as a hundred plants from a packet of seeds which may cost only a couple of rupees. A small percentage of plants may bear single yet, pretty flowers. The varieties generally do come true from seeds in Begonias. The seeds are minute in size. They should be mixed with ten to twelve times their volume of fine sand and sown very carefully in well-drained seed-pans in a soil made up of equal parts of good sand and well-sifted leaf-mould. It is not necessary to cover the seeds. Immediately after watering is done, which should be from below, through the drain-hole, the pot is covered with a plate of glass, which is not removed till germination is complete. When the seedlings have formed three leaves, they are pricked an inch apart in similar soil also in well-drained seed-pans. Watering is carefully done; too much will cause the seedlings to damp off; and too little will cause them to wither away. The seed-pans are placed in shade. When the seedlings are touching each other, they are transferred individually to small 3-inch pots using soil slightly made richer by the addition of a little well-decomposed manure. The young plants are then treated similarly as those grown from tubers. They bloom in six months after sowing and,



Pot-grown Cannas

if they are preserved properly, produce larger blooms next year.

BELAMACANDA

(Natural order. Iridaceæ)

Known as the Black-berry Lily or the Leopard-Flower. A half-hardy bulbous plant, thriving in light rich soil in well-drained sunny situations, bearing orange flowers, spotted with red. The bulbs may be planted three inches deep and three inches apart and watered moderately to start with. Propagated by offsets or from seed, which are shining and black; hence, the common name. Grows wild in Himalayan Duns.

BELLADONNA LILY

See under *Amaryllis*

CALLA

See under *Richardia*

CANNA

(Natural order. Scitamineæ)

The garden Cannas are so very popular in private and public gardens that they need very little introduction. They are derived from *Canna indica*, called the Indian Shot, on account of the round black seeds, which are very hard and resemble shots. It is indigenous to India, having Musa-like leaves and bearing small yellow or scarlet flowers in small erect bunches. The Canna is

a perennial plant with rhizomatous roots, similar to those of Ginger. See figure 9. The stem of the Canna is condensed and fleshy and it creeps underground, sending shoots bearing foliage and flowers from its upper surface and roots from below. The ærial or seasonal shoots die down after the flowers are over and new ones are sent up from under the ground, forming clumps of shoots from a single piece of root in course of time. It may interest a student of botany to note that the bright-looking *petals* of the Canna are really petaloid stamens, that is, modified stamens, which look like petals. The real petals are, however, the three light yellowish green envelopes of the bud. The modern Cannas are furnished with pretty foliage which is green or bronze or coloured purplish and they bear immense erect bunches of very brightly coloured flowers. The plants grow from two to six feet high, are of imposing beauty, being stately in appearance and gorgeous in bloom. They are useful both for bedding and for pot culture, being very free flowering and easy to grow, almost throughout the year. For mass effect in large beds, especially on lawns, Cannas are unsurpassed. As frequently as shoots that have finished flowering are cut away, new shoots bearing fresh stalks of bloom are produced in quick succession.

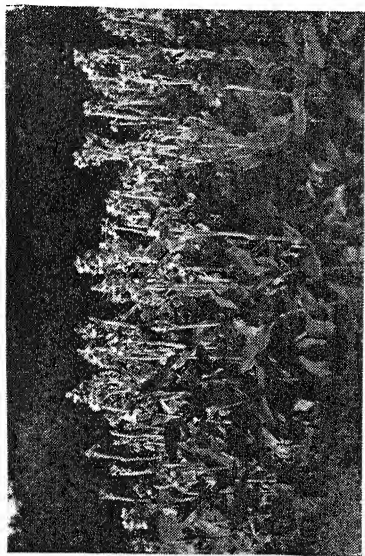
There are several types of the garden Canna. The less significant ones are the *Miniature* and the *Orchid-flowered* kinds. The Miniature Cannas are hybrids of the original species, bearing small compact spikes of

bloom, which are better suited for table decoration than the massive trusses of the later improved large flowering types. In the Orchid-flowered type, which is not popular after the introduction of the *Crozy* or the *Gladiolus-Flowered* type, the individual flowers, though large, do not open except in twos and threes at a time. In the *Gladiolus* flowered type, the flowers are firmer and the flower heads much larger than in the orchid-flowering type. Many of the latest hybrids are improved kinds of the *Crozy* type. The *Alipore Hybrids* are also great improvements on the *Crozies* and in them are available the most attractive colours and colour combinations. The *Dreadnought Cannas* are also improved *Crozies*, remarkable for their gigantic trusses of bloom and immense flowers. The *Dwarf Cannas* furnish a class of dwarf plants growing only about two feet high and hence are eminently suited for bedding in small gardens. In the *Candlebra* class, the flower spike consists of six or more smaller spikes, instead of only two or three.

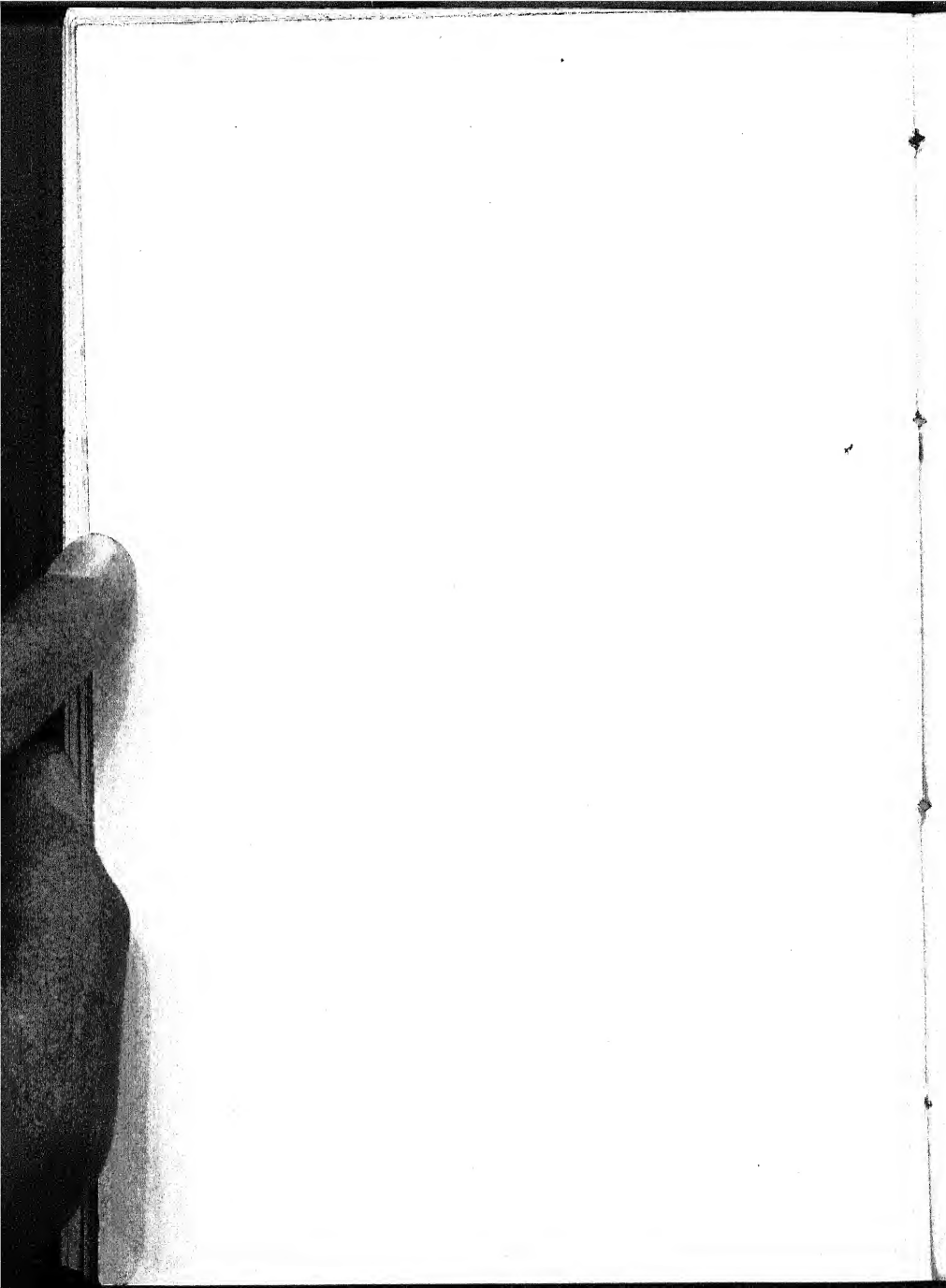
Cannas thrive in sunny situation in deeply worked, and heavily manured soil. They can be grown at all times of the year except during the hottest months in hot places. Planted in June, just about the beginning of the monsoon, they establish soon and form large clumps bearing large spikes of bloom by September, continuing in bloom throughout the cold season. In Madras, *Cannas* are best planted in October. Dig the beds at least 2 to 2½ feet deep. Break up the clods of earth and mix with the soil large quantity of well-decomposed

manure. Split up the clumps of roots and clean them. Throw away unhealthy looking old roots. Cut up the fleshy portions into clean bits, three to six inches long, keeping (on each bit at least one growing bud). Plant the bits two feet apart, covering them up with soil to a depth of two inches. Flood the bed with water and cover the surface with bamboo *thatties* or some other material to keep off sun, if it is very severe. Water once in three days till the shoots come up the soil. Then remove the shading and increase the supply of water as growth progresses. When the plants are growing well, water them liberally soaking the soil through. In about three months, blooms are produced. Cut down the shoots which have finished flowering to the ground level. Feed the plants with liquid manure prepared from *poonac* (oil-cake) or by dissolving a mixture containing two parts of superphosphate and one part of ammonium sulphate in water at the rate of two ounces per three gallons of water. Apply the manure once a week as Cannas are heavy feeders. Dig up the beds once a year and replant them with fresh roots. If water is withheld from a bed and the shoots are cut down to the base and copious supplies of water are given daily after resting the rhizomes for about a week, large trusses are produced on comparatively dwarf shoots.

The cultivation of Cannas in pots too is simple. As the roots fill the soil very soon, large pots or tubs are necessary. Usually, 14 to 16-inch pots are chosen. 5 to 7 bits of roots are put into each pot. The compost consists



A bed of Cannas



of 3 parts of horse manure, 2 parts of red earth, and 1 part of sand. Liquid manure is applied once in ten days. A dressing of manure may be given when the plants are growing well with great advantage. Repotting is done once in six months.

Cannas are subject to very few pests. Sometimes, beetles and caterpillars may be noticed damaging the leaves to some extent. They are not dangerous to the plants and may easily be picked.

The commonest method of propagation is by division of the roots, which grow and multiply. New varieties are grown from seed, obtained after careful crossing. The seeds are very hard and they should be filed through breaking just the seed coat and no more and then sown. They may be soaked in a paste of cow-dung and water for two or three days prior to sowing to soften them.

There are numerous varieties worth growing. Descriptive lists of the latest introductions and old kinds can be had from firms specialising in them. As really improved kinds are being introduced every year, it may not be worth while giving a list of names of best Cannas.

CLIVIA

(Natural order. Amaryllidaceæ)

Also known as *Imantophyllum*. The genus consists of a few species of South African bulbs belonging to the Amaryllis family. *Clivia miniata* is the best known

and largely grown species. The plants are evergreen and form compact sturdy masses of thick strap-shaped leaves resembling those of *Amaryllis*. The flowers are showy, tubular, orange-red in colour and are borne in large umbels on top of stout scapes above the foliage. The bulbs are imperfect and are formed mostly of old leaf bases. The root system is fleshy and thick as in *Agapanthus*. *Clivias* are charming plants for the decoration of the conservatory. They are also valuable for planting in borders. Their flowers are useful for cutting, lasting over a week if kept cool in water.

The bulbs are potted singly in 6-inch pots. But three bulbs are better planted in 12-inch pots for the plants to form effective clumps. After resting them for about fifteen days or so, the bulbs may be re-potted in November—December at medium elevations and in February at high elevations. They do not seem to thrive at low elevations. As they are quick growers and rank feeders, a rich compost made up of 3 parts of manure, 2 parts of red earth, 2 parts of sand, and 2 parts of leaf-mould should be used. Liquid manure should also be used freely once a fortnight. Established plants may be allowed to remain in the same pots year after year with suitable rich top dressing every year at potting season. Re-potting is best done after flowering. Propagation may be by division of clumps but this process is very slow. Ripe seeds germinate well; the seedlings are pricked into nursery beds in good soil, where the bulbs mature and flower in three to four years.

The several species vary in the size of the leaf, the number of flowers contained in the umbels, and their depth of colouring. The important species are the following :—

Clivia miniata bears tubular flowers, 2 inches across by 3 inches long, 15 to 30 of them being clustered in umbels borne on stout erect scapes 12 to 18 inches tall. The colour of blooms is orange-red. The leaves are about 2 feet long. There are some varieties of this species with difference in size of leaves and colour of flowers.

C. nobilis is a sturdy plant with wider and more upright leaves and longer scapes than in the preceding species. The flowers are, however, smaller, pendulous, and as many as fifty of them are crowded together in the umbels.

C. cyrtanthiflora is a hybrid between *C. miniata* and *C. nobilis*. The flowers and leaves are intermediate in size between the parent plants.

COSTUS

(Natural order. Zingiberaceæ)

Rhizomatous-rooted plants, belonging to the Ginger family, mostly natives of India, with neat attractive foliage and leafy stems bearing flowers in spikes with overhanging coloured bracts. They make effective pot plants and they are suitable for rock-planting, in semi-shady situations. Sandy loam to which a little peat is added suits them best. They are cultivated like Hedy-

chiums in smaller pots. Several species are worth growing, of which *Costus igneus* is well known. It has round stems about a foot high and bears handsome round fleshy round leaves and pretty bright golden-orange flowers. *C. speciosus* (showy) is an elegant species which grows about 4 feet, with oval leaves, spirally arranged on the leafy stems, bearing terminal spikes of pure white flowers. This species does well in partial shade even at such low elevations as 2000 feet. *C. elegans*; *C. pictus*; and *C. argyrophyllus* are other attractive species.

CRINUM

(Natural order. Amaryllidaceæ)

An extensive genus of tropical bulbous plants, mostly alike and allied to Amaryllis. Long strap-shaped leaves arise from a tunicated bulb which has a more or less elongated neck. Flowers are white, or rose, or purple-tinted and they are borne on stout stalks well above the foliage in umbels. Most species are natives of India and Africa. Roughly speaking, there are two types of Crinums:—(a) Those which have more or less evergreen foliage and Leek-like elongated bulbs and bear symmetrical, star-like, straight-tubed, more or less erect flowers; and (b) Those which have deciduous leaves and mostly roundish bulbs and bear nodding irregular bell-shaped blooms. Propagation is by division of offsets and rarely from seed. Most kinds are hardy and are

better planted in the ground in borders, as they make large clumps and require lot of root-space. They can also be grown in large 16-inch pots or tubs. No more than ordinary care is necessary in growing them, due regard being had to their resting period when water supply has to be reduced or stopped. Sunny situation, rich friable soil, and plenty of water during growth are necessary. Re-potting need not be done till the numerous roots almost burst the pots. At times, leaves and flower stems are destroyed by caterpillars which should be looked for and picked. The following are some of the best species for cultivation in gardens:—

C. asiaticum has columnar stem-like bulbs, 10 to 15 inches long, which should not be planted with more than three inches of their base in the soil. Leaves are strap-shaped and 2 to 3 feet long. Flowers are borne almost throughout the year, the scapes bearing as many as 50 of them, which are large and deliciously fragrant.

C. Augustum is a very showy species with sweet scented flowers, which are white, tinged with rose inside and purplish-rose outside. A strong stout stalk carries 12 to 20 flowers, each of them expanding to nearly 9 inches across. A native of Mauritius and Seychelles.

C. brachynema is a deciduous species flowering in the month of May before the leaves appear. Flowers are pure white and sweet-scented; 12 to 20 of them are borne on stout stalks rising from the bulbs. Thrives at elevations of about 4500 feet. It can be grown in the plains in pots in shade in a cool place.

C. americanum is from America; it grows about 2 feet high and bears white flowers.

C. giganteum from South Africa, is an elegant species with white flowers, thriving in moist shaded borders.

C. latifolium has long wavy broad leaves and bears white flowers in large umbels.

C. longiflorum has long narrow leaves and bears large bell-shaped pink flowers.

C. Moorei The bulbs are large, 5 to 8 inches in diameter and have long slender stem-like neck which is about 10 inches in length. The leaves are long and wavy and handsome. Flowers are fragrant, bell-shaped, light rose coloured, borne 4 to 10 in an umbel on scapes. A noble species, growing about 3 feet high.

C. Powellii is another handsome species, a hybrid of *C. longiflorum* and *C. Moorei*, with characteristics intermediate to the parents. Leaves are long and gracefully spreading. Plant grows to about 3 feet and bears large showy heads of rose-coloured flowers. Its *variety album* bears white flowers. *Variety rubrum* bears rose-coloured flowers.

C. amabilis; *C. Sanderianum*; *C. Macowani*; and *C. zeylanicum* are some other handsome species.

CROCUS

(Natural order. Iridaceæ)

Popular cormous or bulbous-rooted plants, which can be grown only at high elevations. The bulbs are cheap

and can be got from Holland in thousands. They are employed for ribbon bedding, and for this purpose, they should be obtained in separate colours for effectiveness. Shades of white, yellow, purple, blue and red are available. Crocus can also be grown in pots without any trouble. There are autumn and winter flowering species, all of them thriving well in sandy loam. On lawns and rockeries and on grass banks, they are effective, forming large colonies of themselves in course of time. The bulbs should not be planted deeper than 3 inches. The foliage should not be cut when the flowers are over but, it should be allowed to die down of its own accord.

CYCLAMEN

(Natural order. Primulaceæ)

Genus of attractive cormous-rooted plants with neat dwarf habit of growth and beautiful foliage of radical long-stalked leaves. The flowers are also long stalked and are borne well above the foliage. The colours vary from pure white to crimson and purple. The plants are charming and they are well suited for growing in 6 to 8-inch pots and on rockeries in cool partially shaded situations. The corms are circular and compressed root-stocks, from which the leaves and flowers spring. There are several species; but, the garden kinds are derived from *C. latifolium*, a native of Greece and Syria, though they are known as Persian Cyclamens. *C. africanum*; *C. ibericum*; and *C. neapoli-*

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tanum are some other less handsome species. Several improved varieties are raised by cross-pollination and careful selection. Now, large flowers with crested and fringed petals are available.

Cyclamens are best suited for growing at high elevations, though they may be grown with some success at medium elevations. It is desirable to raise new plants every year, as they can be cultivated easily. Second-year corms, no doubt, flower freely and early too in the season but the blooms are smaller than those on first-year plants. The corms may not be worth keeping for the third year. The seeds are sown in well-drained seed-pans in a mixture of equal parts of well-sifted leaf-mould, old garden soil and sand. They are covered lightly with fine soil. After watering, the pan is covered with a plate of glass to maintain the moisture in the soil and it is removed to a shady situation. The soil is kept just moist without at any time allowing it to run dry, by occasional supplies of water. Germination is very slow and irregular. Tiny bulbs are formed and then small leaves emerge out of the soil in a month or so after sowing. As germination becomes complete and more and more leaves are formed in succession from the tiny bulbs, the young plants are admitted to morning sun, if it is not severe, and the covering glass is removed. Careful attention to watering is very essential at all stages of growth of the plants. Too little water injures them beyond recovery and too much of it causes them to rot away. When the leaves of the adjacent seedlings

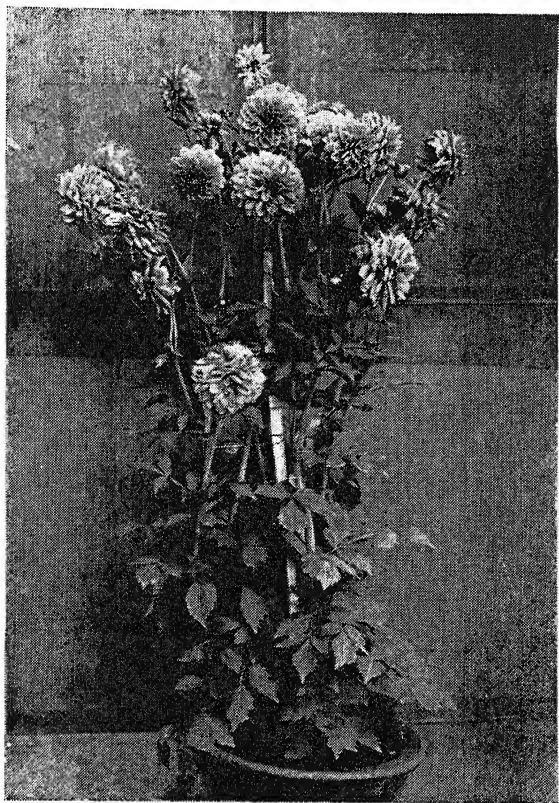
touch each other in the seed-pans, they are carefully lifted and individually potted in 3-inch pots, using a soil composed of equal parts of sand and leaf-mould and loam with a smattering of well-decomposed cow manure. The corms are so planted that their tops are on a level with the soil or are just exposed. If planted deeper, they are liable to rot. The pots are placed in a cool shady situation and as they are filled with roots, the plants are shifted to 8-inch pots, once for all. The compost for this second potting is made up of equal proportions of sand, loam, sifted leaf-mould, and well-decomposed manure. After the plants are well established in the new soil, they are admitted to morning sun and sheltered from wind and rain. Weak liquid manure prepared from cow-dung is applied once a week, from the time the buds are forming till the plants are in full bloom. Syringing the foliage with clear water keeps the foliage fresh and handsome, besides preventing attacks from thrips and red spiders. Blooms may be expected in a year after sowing. If grown well, the corms attain a diameter of about an inch and a quarter and produce as many as twelve flowers at a time in Bangalore; but, 30 to 36 flowers are reported to be borne in cooler places. After flowering, the plants cease to make new leaves, when less water should be given. They gradually turn yellow and die down, when water is withheld altogether. The bulbs are taken out of the soil and allowed to remain for a week or so in a cool dry place and then stored in sand

till next potting. They may be started growth in March to bloom in July to August. One-year-old corms can be imported from bulb specialists, every year, if one is not inclined to take the trouble of raising them from seed. The seed plants generally come true to the parent.

DAHLIA

(Natural order. Compositæ)

The present-day Dahlias are marvellous improvements on the species found by the Swedish botanist, Dahl, in Mexico, in the year 1789. Dahlias are one of the most gorgeously-coloured, free blooming, easily cultivated plants. They are not tuberous-rooted in the sense that Potatoes are, though the roots are known as "tubers." The nourishment for the production of annual or seasonal stems and flowers is stored in fleshy roots which are connected to a condensed crown bearing a number of buds. The fleshy tuber-like root will not, by itself, grow into a plant unless a portion of the crown or stem containing at least a live bud is connected with it. Flowers are single or double. They are variously coloured; the only colour not available is the blue. For mass effect in borders, for cultivation in large beds, and for culture in pots for garden decoration there are few seasonal plants to surpass Dahlias. Flowers are invaluable for cutting. There are several forms and sizes of flowers, and on these characteristics



A well-grown Dahlia



as well as the habit of growth of the plants, Dahlias are classified. They are the following:—

Show or *Double dahlias* are an old type of flowers, being formal and stiff, round or ball-shaped with perfect form. The flowers are medium sized, of one tint or colour and with quilled florets.

Fancy dahlias are similar to Show dahlias but are diversified in colour, the blooms being variegated, tipped, striped or flaked with a tint different from the ground colour.

Pompon dahlias resemble in shape and form the preceding types but the flowers are smaller and produced more freely. The plants too are comparatively smaller but more bushy and hence better suited for planting in shrubbery borders or beds. The *Liliputian* Pompons bear very small, handsome double flowers on long stiff erect stems. The plants are of fairly dwarf habit and free of bloom and hence are favourites of many, being unsurpassed for garden decoration.

Decorative dahlias bear immense flowers, often measuring 7 to 9 inches across. They are fully double to the centre, flat rather than rounded, have broad flat petals with rounded tips or broad points and are truly decorative appearing well above the foliage. This type is midway between the double show and the double cactus.

Double cactus dahlias bear very attractive circular flowers, high in the centre, with florets, long, narrow, and pointed. These are less informal in form than the

Double Show kinds and exhibit a wide and wonderful range of colouring in single colours and combinations of two or more colours.

Pæony-flowered or *Art dahlias* are large and effective and are of recent introduction. The flowers are semi-double and resemble those of the Pæony. There are two or three rows of broad loosely arranged petals, usually surrounding a conspicuous golden yellow centre. The petals are usually pointed and twisted; the inner row of them twists and curls over the centre giving the appearance of the Japanese Pæony.

Collarette dahlias are a new class distinct from others bearing semi-double flowers with broad round petals, with a second row of twisting florets, forming a collar, in most cases, of a different colour round the disc.

Single dahlias are of different forms and sizes and colours. The *Star dahlias* bear pretty circular flowers with eight broad or tapering or rounded or recurved florets overlapping each other. *Single cactus* have long quilled and pointed petals, which may be twisted in some varieties. The *Century dahlias* have broad, regularly placed large petals, making large flowers.

Pigmy or *Bedding* or *Tom-thumb dahlias* are a group of dwarf free blooming kinds, suitable for bedding, as they grow only 12 to 18 inches high. Flowers are single or double.

The Dahlia is propagated in three ways:—from seeds, by cuttings, and by division of the "tubers." From seeds, it is very easy to grow Dahlias to perfection.

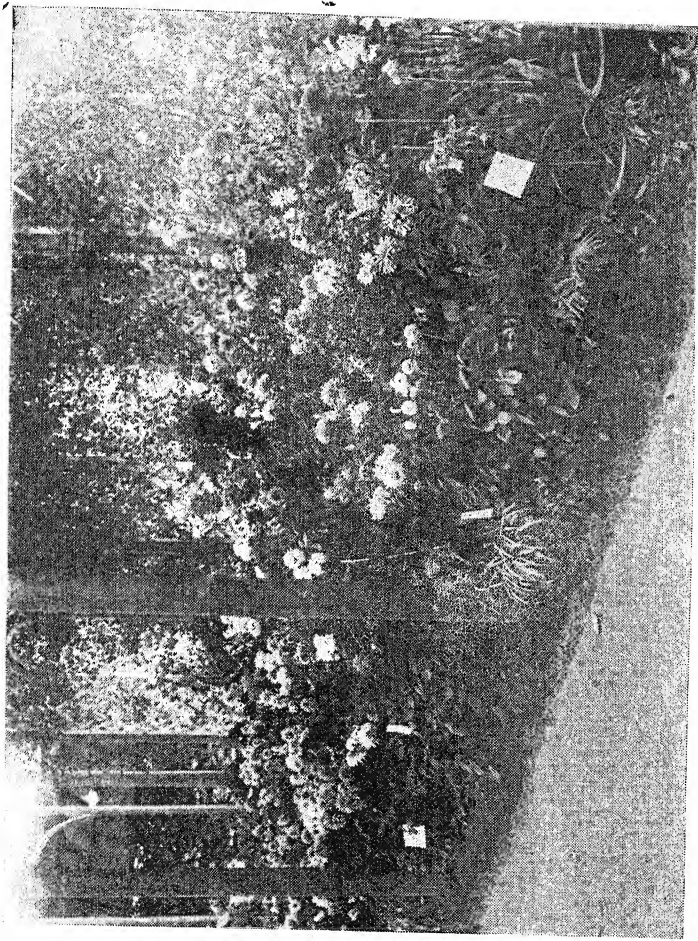
Seeds are used in the production of new varieties. They are also used when one is not very particular about the quality of flowers but wants some flowers for cutting or filling the garden. Some percentage of seeds, even though collected from large double flowers, yield single or semi-double flowering plants. These may be rejected, if there is no merit in them. Seeds are sown in October in the plains and from March to July, from medium to high elevations. If sown about the time for planting bulbs, the seedlings produce strong vigorous plants producing flowers in three months. Seeds are sown an inch apart in seed-pans or in prepared nursery beds in light soil and covered over with a layer of about half an inch of fine soil. When the seedlings are about 2 inches high, they are pricked into 4-inch pots using a compost made up of equal parts of loam, manure, leaf-mould and sand. When the pots are filled with roots, the young plants are shifted to 9-inch pots, in which they are to flower, using a rich compost made up of three parts of well-rotten manure, two parts of red earth, and a part each of leaf-mould and sand.

Propagation by cuttings is the cheapest method of making a collection of choice varieties. This method is adopted commercially, as many more plants may be raised by cuttings from a single clump of Dahlia than by dividing it into several parts. Cuttings are produced by keeping old clumps ("stools") of tubers in sand and covering them over with sand, which is kept moist. The shoots which push up soon, are cut clean with a sharp

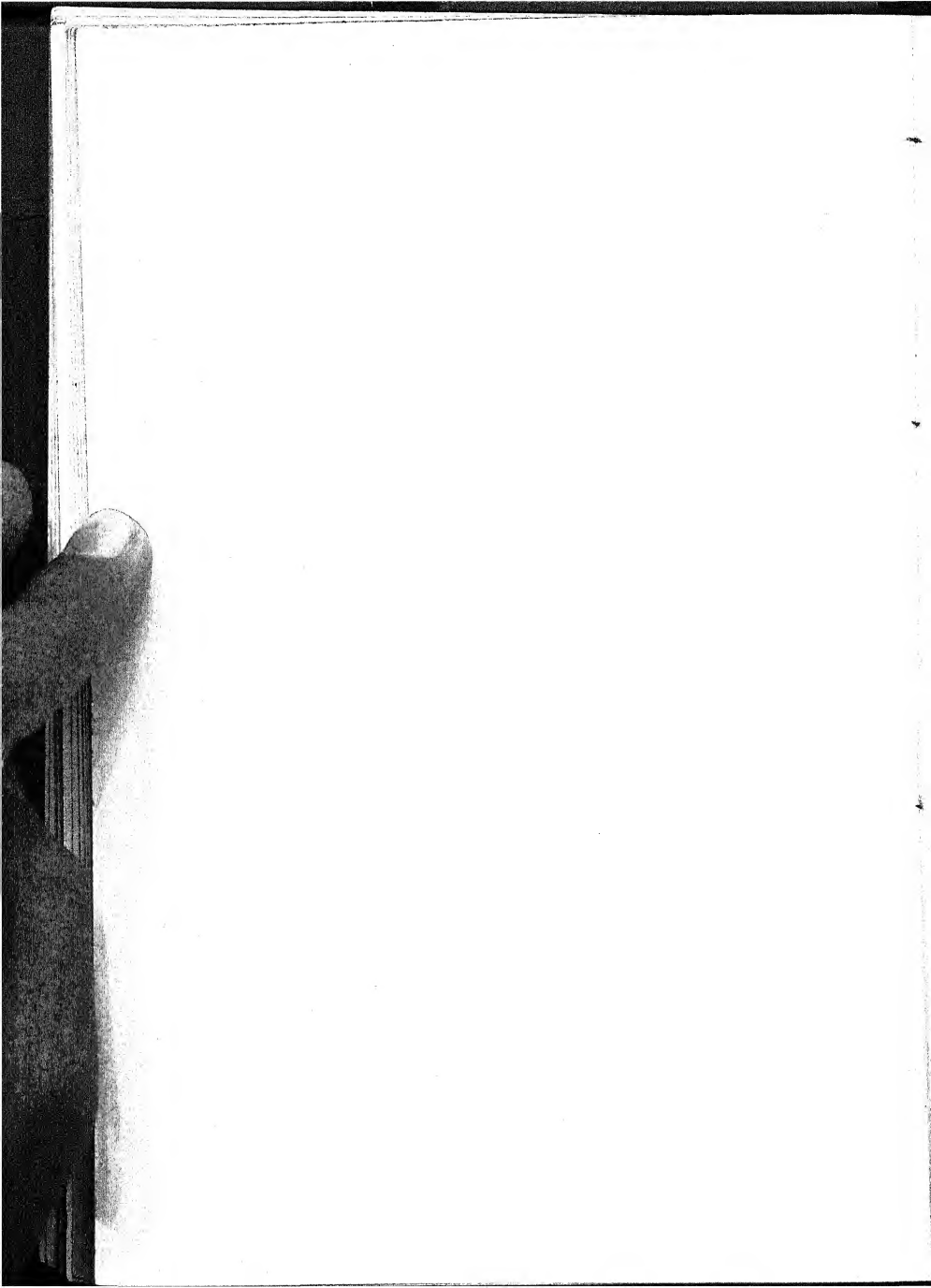
knife when they are about three inches long and inserted in pure sand in seed-pans or round the edge of 8-inch pots or individually in small 3-inch pots and the sand is maintained just moist without allowing it to get dry at any time. Sufficient roots are formed in about a month and a half, when the rooted cuttings may be planted in 8-inch pots. They develop fleshy roots, which give better results next year. Terminal cuttings of shoots taken from the plants when they are growing also give good results. Cuttings without a hollow core have to be chosen. Slips with the heel, taken from the axils of leaves, do better than terminal cuttings. Cuttings, if they are planted late in the season, very often fail.

Propagation by division of tubers is practised at planting time. The clumps are placed in moist sand when the dormant buds swell. They are then divided into as many parts as there are buds, each part being attached to a portion of the stem. The several parts are grown separately in 12-inch pots.

Dahlias are easy of cultivation. They can be grown throughout India, except in the hottest places. A moderate degree of rainfall during its growing and blooming period and a mild climate with comparatively humid atmosphere contribute to best results. At Bangalore, the tubers are planted in the end of May for blooms in August. At Madras, they are planted out in July to bloom in October and November. On the Nilgiris (Ooty), planting is done in March to April. In



Collection of Dahlias—(By courtesy of the Superintendent, Government Gardens, Bangalore)



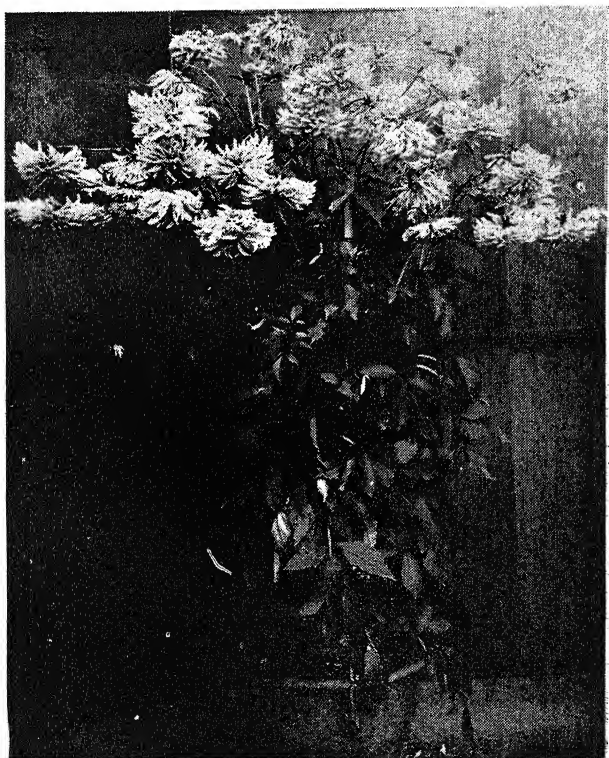
Hyderabad (Deccan) it is done in June or July. Frost affects Dahlias very much and hence in those places which are liable to frost, planting is done early so that the plants may finish blooming by the coming in of frosts.

Dahlias are cultivated in pots in the following manner:—Start the tubers by placing them in a cool place in moist sand for four or five days. Separate the tubers into bits as described above and place each part in a 12 or 14-inch pot according to the habit of growth of the particular variety, the more vigorous kinds requiring larger pots. Place the tuber rather low in the pot, covering it with an inch of soil and leaving about three inches of space above to be later on filled up with rich compost. The compost is made up of 3 parts of horse manure, 2 parts of red earth, 1 part each of leaf-mould and sand. Keep the pots in a sunny spot, sheltered from wind. When the shoots make their appearance from below the soil, remove all but the strongest one. Top this shoot when it is about 8 inches high to cause branching. For large flowers, retain only three of the strongest side shoots that appear soon. Gradually fill the space above the soil allowing some room for watering, with a rich mixture made up of two parts of manure and half each of red earth and sand. Dahlias respond to good feeding and hence supply the plants with liquid manure prepared from ammonium phosphate or from 'poonac,' from the time the buds are being formed till blooms are finishing. Stake the

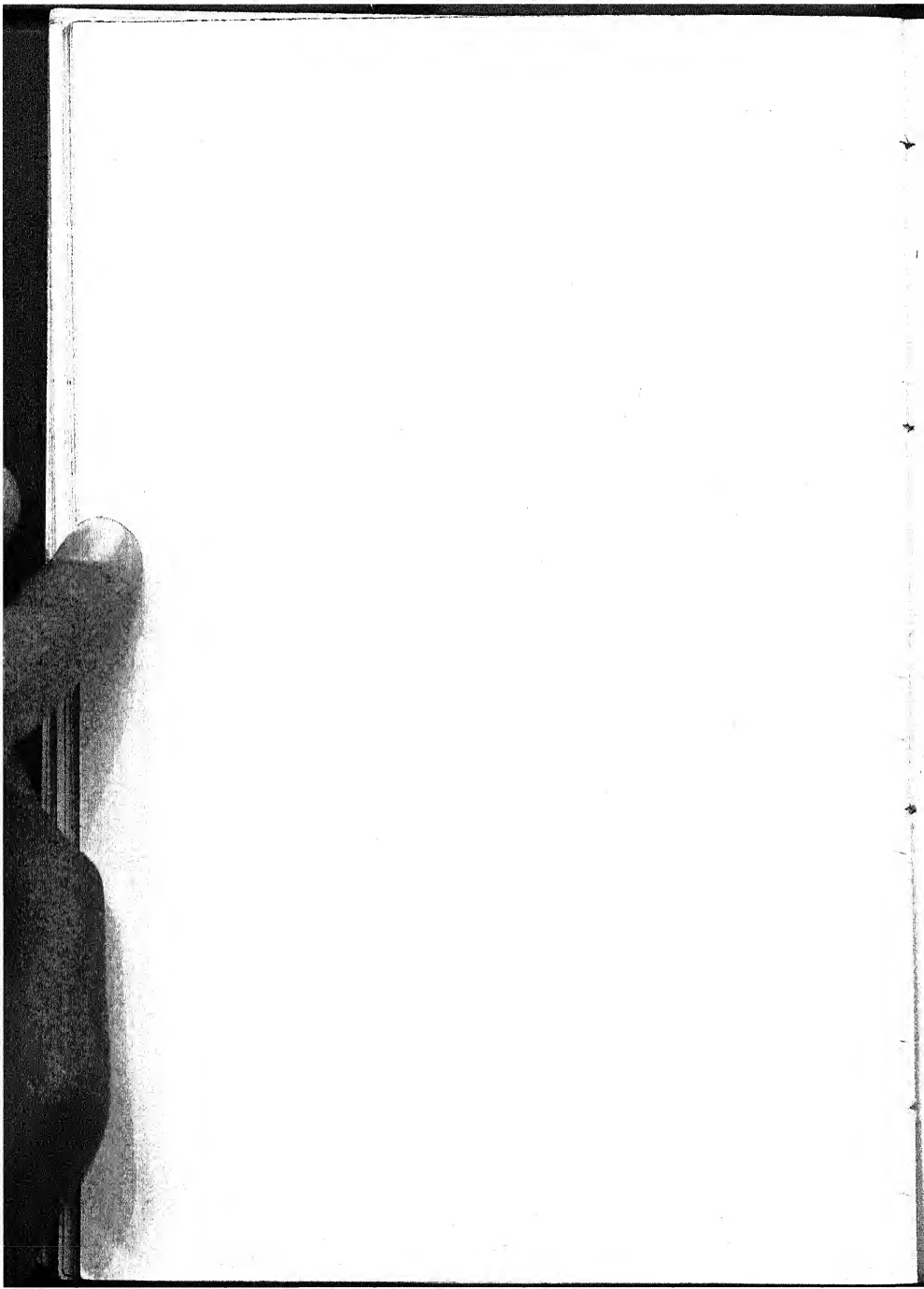
plants suitably, to prevent being blown over by wind, and also to show up the blooms. Water the plants liberally and do not at any time allow them to flag for want of water. Rake up the soil every week or the evaporation will be so great as to necessitate watering twice a day. Blooms may be expected 40 to 45 days after topping. For large exhibition blooms remove all except the crown buds. Generally, the buds come up in threes; rub off the side buds retaining the central one. For large number of flowers consistent with good size, remove the crown buds allowing secondary shoots to come up with flower buds; of these, retain the central buds only. The plants continue in bloom for more than two months. After the flowers are over, reduce gradually the supply of water till the leaves and shoots die down. Now withhold water from the tubers, cut back the stems to the level of the soil, take them out, and store them in sand.

Dahlias are grown in the ground in much the same way as in pots. Make holes, 18 to 24 inches deep and fill them with compost recommended above, if the soil is not good. Dahlia thrives in any good garden soil, which has been enriched with manure. It does well in open sunny situations, sheltered from wind and away from the robbing roots of large trees, if liberally watered.

Dahlias are comparatively free from insect and fungus pests. Green flies and aphids are very common on their shoots but they may be checked by spraying with clear water or weak decoction of nicotine in water. Slugs



A well-grown Dahlia



sometimes attack them. Beetles are also found eating leaves and foliage. All these are easy to manage.

EUPHARIS

(Natural order. Amaryllidaceæ)

Genus of handsome South American Amaryllids with broad radical leaves about a foot and a half in length. The foliage is evergreen and brightly polished. The bulbs are onion-like. Flowers are pure white, sweetly scented and five to seven of them are borne on stout scapes well above the foliage. Flowering period is late winter but by suitable treatment, that is, by resting them after making growth and starting by regular applications of water, the bulbs can be induced to bloom at other times of the year too. A soil which is inclined to be heavy and is not very rich, suits them best. If not disturbed often, flowers are freely produced. Shade from sunshine, good drainage, liberal supply of water, syringing of foliage to keep it clean, and applications of liquid manure (dung water) when the flower-scapes show, are necessary for success. Some times, black caterpillars are very destructive on leaves and flowers and these are best handpicked. *E. grandiflora* is by far the best species and it is one of the most beautiful white flowering bulbous plants. It is usually grown in 12-inch pots, 5 to 6 bulbs being put in a pot. They should be potted firm with their tips exposed. If bulbs are not rested for about 15 days

before potting, they do not bloom satisfactorily. Pot-bound plants which have been wintered and top-dressed, flower very freely.

EURYCLES

(Natural order. Amaryllidaceæ)

Free flowering handsome bulbous plants which are natives of Queensland, with broad cordate leaves and creamy white flowers resembling those of *Eucharis* on peduncles, 12 to 18 inches long. They are grown like *Eucharis*, singly in 6-inch pots, or 3 to 4 of them may be put in 10-inch pots. *E. amboiensis* is the species largely cultivated; it grows 1 to 1½ feet high and bears pure white flowers in a many-flowered umbel. *E. Cunninghami* bears less crowded umbels and it is known popularly as the Brisbane Lily.

FREESIA

(Natural order. Iridaceæ)

A genus of South African dwarf cormous plants producing elegant bell-shaped delicately perfumed flowers, 6 to 8 of them being borne in clusters on tender stalks above the foliage. The flowers are useful for cutting and they are now available in different shades of rose, yellow, purple, lavender, as well as in white and bicolours. *Freesia refracta*, *F. aurea*, and *F. Armstrongii* are handsome species. *R. refracta alba* bears charming



Eucharis



white flowers. Put 5 to 8 large-sized bulbs into 8-inch pots in the general soil recommended for bulbs in the introduction covering up the bulbs lightly and press down the soil firmly. Water sparingly at first and increase the supply as growth progresses. Give weak liquid manure, prepared from guano or cow-dung once in ten days. It is essential to note that only mature bulbs which have received good treatment during the growing season that bloom. Decrease the supply of water as the leaves change colour and stop it when they dry up. Keep the pots dry for about 15 days and take out and store the bulbs. Undeveloped and small bulbs should be separately grown as they will not flower till they are mature and strong. Freesias flower from seed the third year after sowing. As the seedlings do not transplant well, sow the seeds thinly in seed-pans or 6-inch pots and thin them out should they crowd each other. Though some hardy types can be grown in the plains, Freesias thrive best from medium to high elevations.

GESNERA

(Natural order. Gesneraceæ)

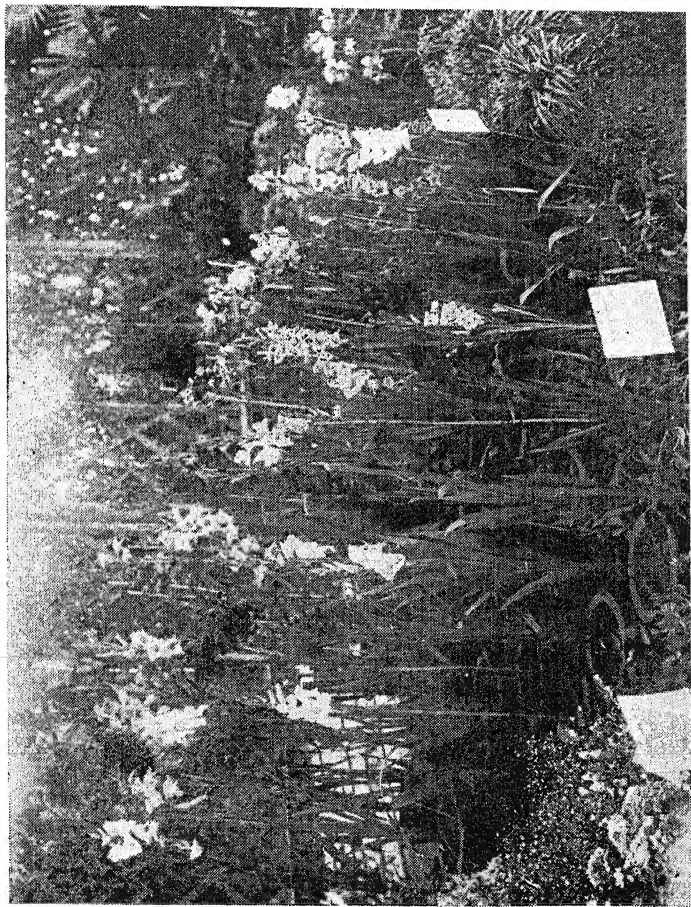
Pretty tuberous-rooted South American plants of dwarf growth, both the foliage and the flowers of some species being very handsome. Flowers are very showy, tubular, and brilliantly coloured and they hang down gracefully from branching flower stems. Only one or two species can be grown with some amount of success

in the plains; but all of them may be successfully grown from medium to high elevations. Gesneras are allied to Gloxinias and Achimenes and require the same treatment as the former. Open well-drained light soil, careful watering, and shelter from strong sun and rain are necessary. Propagation is from seed or by leaf-cuttings. Succulent-leaved species can be increased by leaf-cuttings or cuttings of stem, tips of shoots being used for this purpose. They form small tubers, from which the plants are grown during the next season. There are several new hybrids of Gesnera, which are very pretty. *G. splendens* grows 1 to 1½ feet high, is hardy, and bears bright red, showy flowers. *G. fulgens* is another handsome species, with velvety purple-tinted foliage and rich dark-red flowers.

GLADIOLUS

(Natural order. Iridaceæ)

Gladiolus is the most popular member of the Iris family. The genus consists of herbaceous cormous plants with sword-like plaited leaves and terminal spikes of generally bright coloured, irregular flowers. There are numerous species, as many as 150 or more, most of them being natives of South Africa. They are only of botanical interest and are now eclipsed by several strains of excellent garden hybrids. The earliest hybrids were produced in 1837 in Belgium and they go by the name of *G. Gandavensis*. The modern varieties



A show collection of *Gladiolus*—(By courtesy of Superintendent, Government Gardens, Bangalore)

of this strain are noted for their remarkable length and thickness of spikes, large flowers and range of colours. The *Lemoinei* or *Butterfly type* was next raised about 1875 by crossing *G. Gandavensis* with old species. The flowers of the *Lemoinei* class are hooded, and open not more than 4 to 6 at a time on the spikes and it is believed the plants are hardier than those of the *Gandavensis* race. Another race of pretty modern *Gladiolus* is *G. Nancyanus*, which was also raised by Lemoine about 1883. Another hybridizer raised similar plants about the same time and he styled them *G. Childsii*. These two latter races are noted for the large size, openness, and rich and varied colours of their flowers; although their spikes are less crowded with flowers and are less rigid than those of the *Gandavensis*, they are none the less the beautiful. *G. brenchleyensis* is another good race of *Gladiolus*. The latest hybrids belong to the *G. primulinus*, derived from a beautiful yellow flowering hardy species found near the Victoria Falls in South Africa. The *primulinus* type is distinguished by the hooded top segment of the flower. The flowers of modern *Gladioli* are most of them 4 to 6 inches across and they are available in a marvellously wide range of colours—grey, purple, scarlet, crimson, rose, pink, salmon, yellow, orange, and white—mottled, blotched, and striped with variegated colours in the throat and the petals. The plants grow three to five feet high and their handsome green grassy foliage surmounted with the gorgeously coloured spikes of flowers make

them very useful in borders and as pot plants. The flower spikes are invaluable for cutting for vase decoration, every spike coming to full development to the last bud when placed in water.

Gladioli are hardy seasonal plants and they can be grown in well-prepared beds or borders in sunny situations sheltered from wind. They can also be grown with great advantage for indoor decoration in pots. They thrive from medium to high elevations, where they are started in May—June to flower in August—September. On the plains, the imported bulbs may be grown for a season, starting their growth in September for blooms in December—January. Rich deep soil is necessary for growing them successfully. The general compost recommended in the introduction, suits Gladioli well. For culture in the ground, dig the ground to a depth of a foot and a half and put well-decomposed manure about a foot from the level of the surface. Plant the bulbs three to four inches deep, allowing room for the new corms to be formed above the old ones. They may be planted five to six inches apart in rows seven to eight inches apart. To start the corms, place them in moist sand till their buds swell and grow about quarter of an inch. Plant them three inches deep in pots or in the ground, placing some sand above and below the bulbs. Water sparingly to start with and gradually increase the supply of water when the plants are growing. Stake the plants when they are six inches high; want of suitable staking results in bent stems and twisted flower

spikes. Liquid manure, prepared from guano or sheep or cow-dung, can be applied once in ten days. A dressing of well-decomposed sheep manure or horse manure mixed with some loam may be applied with benefit when the plants are established and are growing well. After flowers are over, the leaves turn yellow. Reduce the supply of water till the leaves dry up. Then cut back the stems to two inches from the base and lift the corms, and store them after drying them as described in the general introduction.

Propagation is from seed or by spawn. From seeds, new varieties are obtained. Sow seeds in well-drained seed-pans in a soil composed of leaf-mould, loam and sand in equal proportions. Thin out seedlings, if they are overcrowded. Admit morning sun to the seedlings while still young and when they have grown about three inches, put them in the sun. Allow the plants to remain in the pans for two seasons. At the end of the second year, the small corms are large enough to be potted; put five to six of them in 6-inch pots and treat them well to mature and flower during next season. The more rapid method of propagation is from spawn. The plants from spawn are true to the parent. Spawn are sown like seeds and the young plants are treated similarly to seedlings. They will flower in two or three seasons.

GLORIOSA

(Natural order. Liliaceæ)

Gloriosa superba, called in Canarese 'Karadikanninagedde' the best known species. It is a tall, weak-stemmed, slender deciduous, tuberous-rooted, creeping plant supporting itself by means of tendril-like prolongations of the leaves. The plants are dormant in winter (November to February) and grow wild in hedges in moist districts in Concan and Mysore, year after year producing their annual slender but vigorous stems which die down after the growing period leaving the dormant tubers under the soil. The flowers are produced in great profusion during the rainy season. They are peculiar, with long-twisted wavy or crisped petals, reflexed after the manner of Cyclamens; they are light yellow in one half and crimson in the other, the entire flower changing colour to crimson with age. *Gloriosa* can either be grown in pots or in the ground by shrubs with thin foliage to creep on. Planting is done at the beginning of the rainy season in June. A tuber may be put into a 12-inch pot, which should be provided with a balloon. Light rich soil is best suited. Little water should be given till growth commences, after once copiously watering after planting. Liberal watering is necessary while actively growing. As stems die down, withhold water. The tubers need not be lifted from the ground.

GLOXINIA

(Natural order. Gesneraceæ)

The garden hybrids of Gloxinia are mainly derived from a single species, *Sinningia speciosa*, which was introduced to England from Brazil in 1817. The original species of Gloxinia have nodding flowers with narrow tubes and their colour is either white or purple. But the improved garden hybrids bear erect flowers of varied colours such as scarlet, blue, pink, and of mottled forms. Gloxinias are dwarf plants with hairy radical leaves and very short stem, producing very showy bell-formed flowers on stalks. Flowers are available in exquisite shades of colour and are beautifully speckled and blotched in several kinds. The plants with their large soft velvety leaves and handsome flowers make a gorgeous display inside conservatories. Gloxinias are warm-temperate plants suited for elevations 4000 to 7000 feet above the sea and they are short lived in hot places at low elevations. They are best grown in pots like tuberous-rooted Begonias. The cultivation notes for tuberous Begonias are generally applicable to the culture of Gloxinia. Do not wet the foliage while watering. Shade the plants from direct sunshine. Maintain a sweet moist atmosphere, avoiding sudden chills and droughts. Apply liquid manure, once a week, when the buds begin to unfold, to prolong the blooming season.

Gloxinias may be raised from seed or by cuttings of leaves or stem. Seeds are best sown early in spring, in

March to April. The seeds are sown and the seedlings treated similarly as tuberous-rooted Begonias and the cultural notes of that plant may be referred to for further information. Mature leaves with small portions of their stalks attached to them are inserted in sand in seed-pans and kept in a hot-bed. Uniform heat is maintained and watering is so done that the sand is just kept moist.

Gloxinia maculata is a hardy vigorous growing plant about a foot and a half high with pretty glossy succulent bronzy-green leaves, producing in October to November, large blue bell-shaped flowers. In partial shade, in rich light soil, *Gloxinia maculata* thrives well, if freely supplied with water during the period of active growth. The resting period is from December to May, when the large worm-like scaly tubers (see figure 8) should be stored in sand in a dry cool place. Start the tubers to growth and plant one or two into a 10-inch pot.

HÆMANTHUS

(Natural order. Amaryllidaceæ)

Popularly known as the Blood Flower or Blood Lily. Several species are from South Africa. Large heads of flowers resembling powder puffs are produced on stout stalks about a foot high. In most species, flowers precede foliage, which consists of broad oblong thick leaves. The bulbs may be grown either in pots or in the ground. They like a sunny situation and

require plenty of water while the plants are growing till the leaves begin to decay, when the supply should be reduced. Three bulbs may be potted firmly in 10-inch pots. They may be planted out six inches apart, for massing. Weak liquid manure applied during growth strengthens bulbs. Propagation is from offsets, separated while planting. Small bulbs produce no or small flowers; the size of the head increases with the size of the bulb. Planting is done early in spring, in March in Bangalore.

H. multiflorus (*Kalbreyeri*) bears large heads of scarlet-crimson flowers with yellow anthers. *H. Lindeni* is another attractive species with bright crimson flower heads.

HEDYCHIUM

(Natural order. Scitamineæ)

Popularly known as Orchid-Lily, Butterfly-Lily, Ginger-Lily or the Garland Flower. Genus of ornamental plants belonging to the Ginger family, with rhizomatous roots and reed-like stems bearing long narrow leaves and terminal clusters (racemes) of showy flowers which are fragrant in several species. They are grown much in the way as Cannas in well-trenched ground or in large pots or tubs and supplied freely with water. They can be treated as semi-aquatics, as they require a lot of moisture at the roots, and hence are suited for planting near the banks of a pond in the partial shade of trees and in similar situations. The

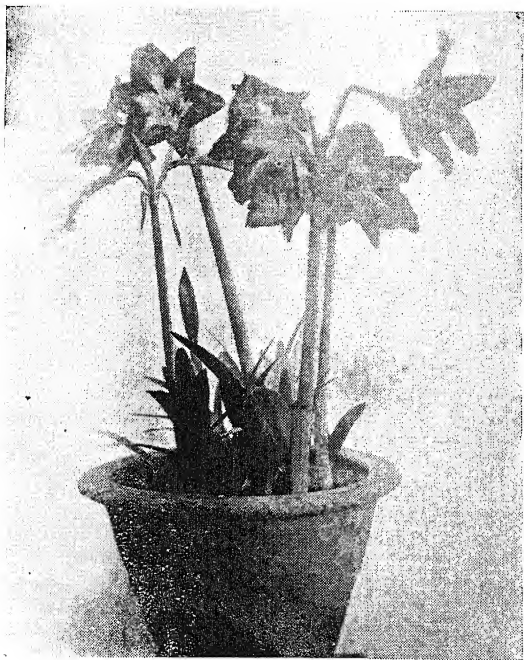
plants grow from three to seven feet high and bear in the rainy season, July to November, large clusters, which measure six to eighteen inches long by four to ten inches in diameter in the several species. The stems above the ground die down in cold weather. Propagation is from the centipede-like rhizomes, the roots anchoring them as they lie on the surface of the ground. The rhizomes are not to be planted deep.

There are several species, almost all of them natives of India. *H. coronarium* (The Indian Garland Flower) is one of the loveliest species, growing about six feet high bearing large racemes of fragrant white flowers. This species is suited for low elevations and thrives in deep soil with abundant supplies of water. *H. coccinium*; *H. elatum*; and *H. flavum* are some other species worth cultivating. *H. Garderianum* is a Himalayan species, growing four to five feet high with clusters of yellow flowers; suited for medium to high elevations.

HEMEROCALLIS

(Natural order. Liliaceæ)

The Day Lilies are vigorous growing dwarf fleshy rooted plants with grassy linear-acute, two-ranked leaves, and yellow or orange, single or double flowers borne on scapes about three feet tall. Flowers of some species are fragrant. All are suited for growing in mixed borders or grouping in beds or on rockeries. By ponds, near the waterside, they are effective. Pro-



Amaryllis (Hippeastrum)

pagated by division of roots, and grown easily in any good garden soil with little care.

H. fulva bears dark orange flowers.

H. flava (Lemon-Lily) is a sweet-scented species with yellow flowers. Introduced from South Europe.

H. aurantica (Golden-Lily) bears large orange-red fragrant blooms. Native of Japan.

HIPPEASTRUM

(Natural order. Amaryllidaceæ)

The garden hybrids of *Hippeastrum* are familiarly known as *Amaryllis*, and they are evolved from *H. vittatum*, *H. Reginae*, *H. pardinum*, and *H. Leopaldi* by crossing and intercrossing for the last one hundred years. Large trumpet-shaped flowers, two to four in number, are borne on stout erect scapes, one to two feet high. Flowers are pure white to crimson, blended in a variety of streaks and bands. They are invaluable for cutting for decoration in the vase. Daily, the water is changed and the base of the flower-stalk is sliced a bit. Treated this way, the flowers retain their freshness for a week.

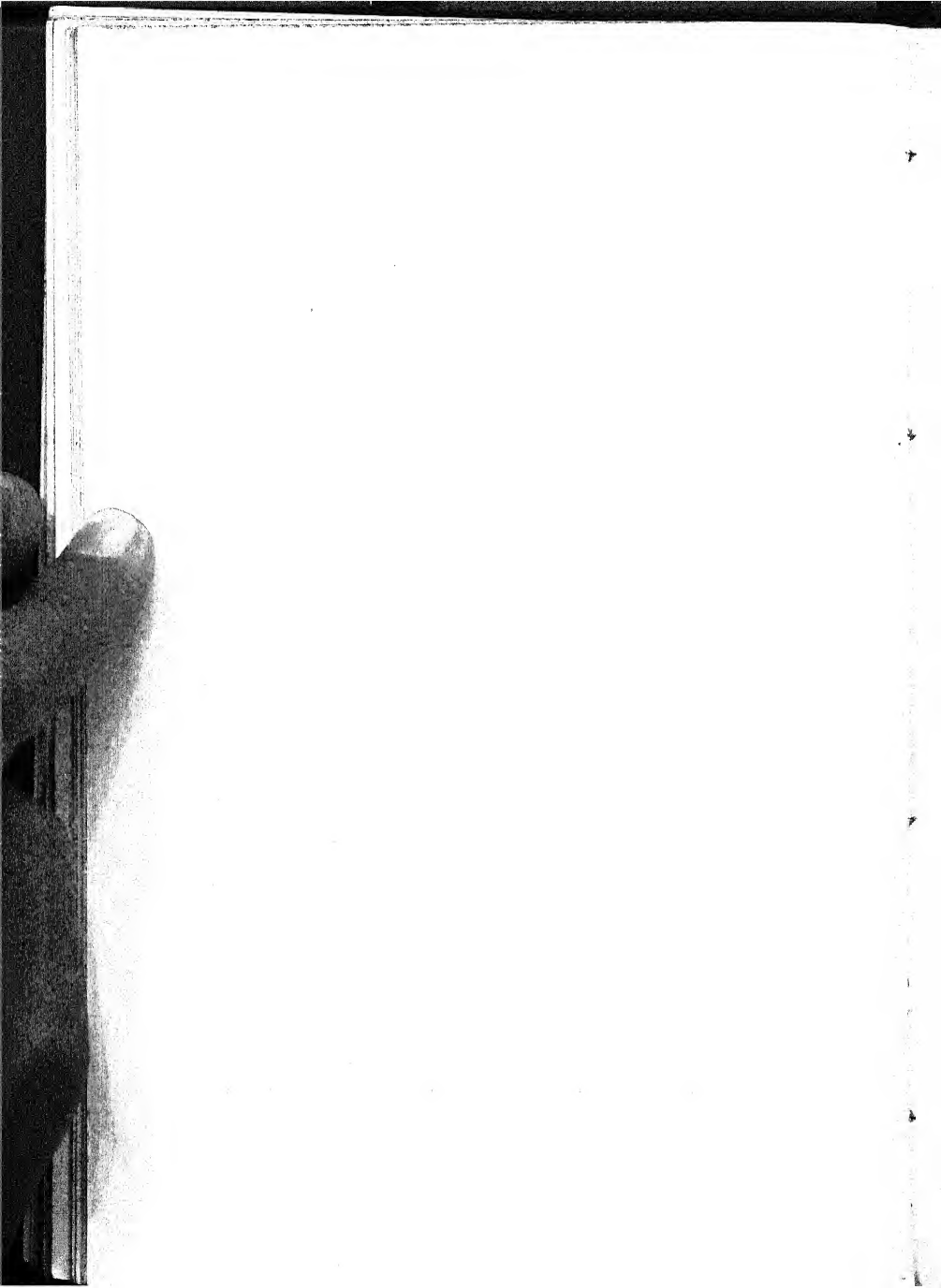
Amaryllis is useful in borders and for edging walks and paths. It furnishes beautiful plants, easy to grow at low, medium, and high elevations. Once planted in prepared beds or borders, it needs no more than ordinary attention, thriving and increasing in size and producing offsets in the rainy season, going down to

rest about November and coming up again with its beautiful flowers with the approaching rains in April to May. Mature bulbs are certain to bloom. Smaller bulbs may be put in 6-inch pots and larger ones into 8-inch pots; three medium sized bulbs may also be planted in a 12-inch pot. The top portion of the bulb should be left exposed while planting. The bulbs may be allowed to continue in their old pots, if there are not many offsets; and they may be top-dressed with a rich mixture composed of two parts of well-decomposed manure and one part of loam. After repotting or top-dressing as the case may be, the pots are watered; and they are better plunged in a layer of damp cocoanut fibre or soil to encourage root formation before the flower-buds are pushed up; if treated thus, flowers are brighter and larger than otherwise. After ten days, the pots are taken out and sparingly watered; at first the supply of water is increased with increasing root formation and growth. After the flowers are over, leaves appear and the plant begins its growth, when liquid manure prepared from guano or cattle or horse-dung is applied once a fortnight. Water supply is gradually reduced when the leaves begin to turn yellow and stopped when they die down. The bulbs are then taken out and left in sand or allowed to remain in the same pots.

Amaryllis is ordinarily raised from offsets. Bnt, it can be easily grown from seeds, the bulbs maturing in about three years. By careful crossing new varieties are



A Double Hippeastrum (a freak)
(By courtesy of Superintendent, Government Gardens, Bangalore)



obtained. Only the best varieties are used for this purpose. It is simple to cross-fertilise *Amaryllis*. The anthers which carry the pollen grains on them, are removed when the flowers are only half-opened, and the stigma may be fertilised with the pollen from another selected flower two or three days later. The seeds are sown fresh and the seedlings pricked out into sandy loamy soil. They do not lose the foliage the first winter and they develop bulbs which may flower in three years.

The bulbs are started growth in November to December in the plains and in March to April in the hill stations. They have to be protected from frost at high elevations and for this purpose, the soil is covered with a layer of straw or old leaves.

HYACINTHUS

(Natural order. Liliaceæ)

Hyacinth is too delicate for growing in this country. It can be grown from imported bulbs at high elevations. In Holland, where it grows without much care, it is grown in borders, beds, on rockeries, and on lawns. But, it is grown only in pots here, and that only with limited success. Obtain the best bulbs and start growth in 5-inch pots, in September to October. Drain the pots well and put under each bulb some sand. Just cover the bulb with soil, placing some sand on the bulb also. Damp the soil and remove the pot to a dark place in

shade or plunge them four inches deep in cocoanut-fibre. Keep the soil just moist. In the course of four to six weeks, sufficient roots are formed, filling the pot. Then, remove it to a brighter place and admit morning sun to it. Till the flower spikes are an inch and a half above the soil, it is better to keep the pot away from strong light.

Hyacinth is propagated from small bulblets which are developed at the base, when it is cut crosswise in a number of places. The small bulblets are separated from the parent and planted in beds to mature in three to four years.

HYMENOCALLIS

(Natural order. Amaryllidaceæ)

Easily grown plants, allied to *Pancratiums*, and called Spider Lilies, bearing fragrant white flowers in large clusters on stout stalks. Grown like *Pancratiums* and *Crinums*. *H. amœna* bears sweet-scented white flowers with a greenish tube. *H. speciosa* bears showy, white, very fragrant flowers. *H. littoralis*, *H. ovata*, *H. tenuiflora* and *H. calathinum* are a few other important species.

IRIS

(Natural order. Iridaceæ)

Genus consisting of more than 200 species; but only a few are worth cultivating in gardens. Iris forms a very interesting class of plants with two-ranked narrow leaves and remarkable gorgeously coloured flowers,



Iris grown in pot

which are curiously constructed resembling Orchids. It is possible to have some species or other of Iris in flower throughout the year and many kinds are so easily and abundantly grown in temperate climates, that they are known as "Poor Man's Orchids." There are two sections, the rhizomatous-rooted and the tuberous-rooted or the bulbous sections. There is such a diversity in their habit of growth from three inches to three feet and in their requirements that they have to be treated differently. Propagation is from seed or offsets or division of rhizomes.

Iris do not thrive at low elevations. They are best suited for sub-tropical and temperate conditions, and hence only from medium to high elevations. Rich sandy soil containing a large quantity of leaf mould and well-decomposed cattle manure suits them best. The tubers or the rhizomes are not to be kept out of the ground for any length of time. As the different kinds flower at different times in the year, they are to be planted accordingly. Deep planting is to be avoided. Plentiful supply of water is necessary when in rapid growth. Culture may be in pots or in the ground, in beds or borders. The following are a few desirable species:—

I. chinensis bears violet-blue flowers; is eminently suited for growing at low elevations.

I. germanica ("Flag Iris") is an ornamental species bearing blue, purple or white flowers, in April to May.

I. japonica, the Japanese Iris, bloom from June to August and September, bearing large flowers which

often measure six inches in diameter with a breadth of petal, about three inches. These are available in several colours, white, purple-red, rose, crimson, blue, lilac, in several shades.

I. siberica bears elegant narrow leaves and bright blue flowers.

I. hispanica, the Spanish Iris, are tuberous-rooted and bear flowers of distinct shades as blue, yellow, white, bronze, dark purple, etc.

I. florentina bears large white flowers in the rainy season. Requires moist treatment.

I. xiphoides (the English Iris) grows about two feet high bearing variously coloured flowers.

ISOLOMA

See under *Tydaea*.

IXIA

(Natural order. Iridaceæ)

Known as the African Lily. South African bulbs of easy culture with grass-like foliage and spikes of star-shaped flowers, which are in many kinds brilliantly coloured. They are hill-types and thrive only 4000 feet above the sea, being grown like *Gladiolus*. Five bulbs may be planted in a 9-inch pot and covered over with two inches of soil.

KÆMPFERIA

(Natural order. Zingiberaceæ)

Dwarf ornamental plants grown for their foliage and flowers. The roots are rhizomatous and Ginger-like. The leaves are variable, being egg or lance-shaped, green or variegated, bordered or flaked with white above and purple beneath. Plants are deciduous and usually produce the delicately scented flowers in a crowded manner close to the ground before the leaves appear. The buds open in a regular manner, opening day by day in the morning and fading in the evening. The roots are separated and repotted after the leaves die down in proper season in light rich soil, putting four to six pieces in a 9-inch pot. Repotting may be unnecessary every year. Flowers are usually produced in January and February. The plants are fed with liquid manure while growing well. Several species are garden favourites. The following are noteworthy :—

K. rotunda known as *Boi-campa* in Hindi and *Nela-sampige* in Canarese, is a fine deciduous species, the flowers are white and violet, and are produced close to the ground, in April to May. The leaves are oval-lanceolate, green shaded with dark tints, and they die down in November.

K. galanga. (known as *Chandramulika*) has roundish sessile leaves of refreshing green, lying flat on the ground. Roots and leaves have an agreeable smell when bruised. Flowers are white, with two purple

spots and they are borne in the axils of leaves at the approach of the rainy season.

K. Gilberti is a foliage species, with green leaves, bordered white. Flowers are small, purple and white.

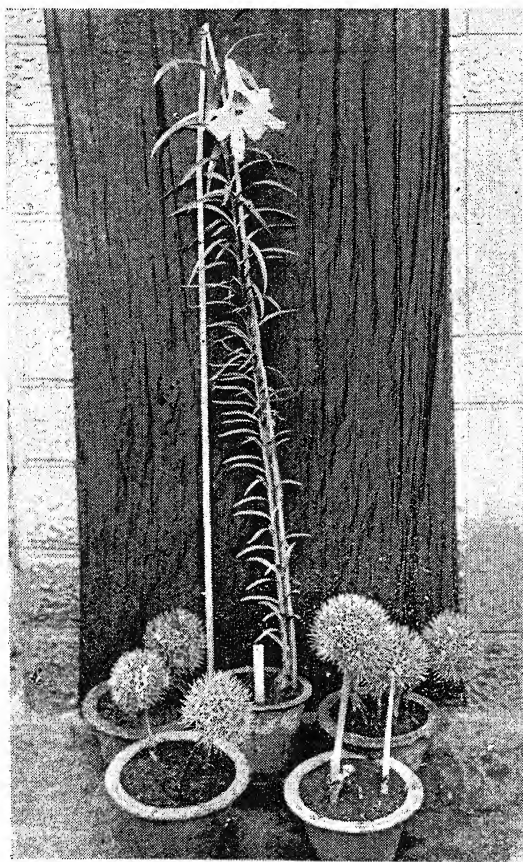
K. Kirkii, *K. ornata*, *K. speciosa* and *K. Parishii* are other desirable species.

KNIPHOFIA

(Natural order. Liliaceæ)

Synonymous with *Tritoma*. Known popularly as Red-Hot-Poker Plant or Flame flower. A genus of very ornamental plants, chiefly from South Africa, with abundant radical leaves and flowers, which are orange, salmon, scarlet, white or pink in the several species, closely packed in immense spikes on tall scapes. *Kniphofias* are only suited for subtropical conditions and they do not thrive at low elevations in India. They are easily grown plants, require a light sandy soil, plentiful supplies of water while growing, a sunny position and some well decomposed manure to be forked into the soil near by. Planted on lawns in groups or by the side of ponds or in mixed borders, they are effective. Propagated from seed, it blooms the second year after sowing; can also be increased by division.

T. aloides is the parent of many of the excellent garden hybrids and it is a striking object while in bloom. Leaves are two to three feet long and about one inch broad. Flowers are coral-red in colour, fading to orange-



Lilium sulphureum and *Haemanthus* in pots



red. They are borne densely on spikes, which are about six inches long and three inches thick on peduncles as long as the leaves.

LILIUM

(Natural order. Liliaceæ)

A widely distributed large genus, most species coming from Asia. They grow wild on mountain slopes near small streams in pockets of rich soil washed down into them. They form a class of plants, generally requiring the same treatment in cultivation and thriving well only 4500 feet and above the sea. Some hardy species may be induced to bloom at somewhat lower elevations but the bulbs perish after one season. Liliiums require a comparatively cool atmosphere with moisture all the year round. For purposes of culture, Liliiums may be divided into three classes:—(1) Stem-rooting kinds, which form a second and distinct root system on the stem above the bulbs in addition to those roots which are formed at the base. The roots on the stem support the plant during the growing period, leaving the original roots to concentrate their energies on the bulb. These kinds of bulbs should be planted much deeper than other kinds. About six inches of soil above the bulbs may be sufficient. In planting them in pots, the pots are only filled one-thirds full with compost and the bulbs placed over the compost and just covered with compost. As the stem grows, the space in the pot is filled with more compost. The remaining space in the pot is only

gradually filled as more and more growth is made by the stems. (2) The non-stem-rooting kinds may be planted to a depth of two and half times the diameter of the bulbs. Figure 15 shows how a bulb is potted. (3) The Swamp Lilies require a soil that is always moist but not waterlogged. Sandy peat to a depth of a foot and a half would suit them best. Lilies with few exceptions dislike lime in the soil. Animal manure too is not conducive to good results. Sandy soil containing a large quantity of leaf-mould in a well-decomposed state is best suited for most kinds. Lilies can be grown in raised beds in suitable soil. Several kinds make charming pot plants. A situation where they get only morning sun is to be chosen. Watering is done very sparingly till growth starts, keeping the soil just moist. When the plants show signs of withering after flowers are over, water supply is reduced and it is stopped when the annual stems are decayed and the bulbs are resting. Weak liquid manure, prepared from cow-dung, may be applied once a fortnight when the pots are full of roots. Frequent disturbance of the soil does irreparable injury. Most Lilies are started growth in March to April.

Lilies can be raised from seed, taking five to six years to mature and bloom. In the case of such kinds, which produce blooms for two or three years and then die, it is advisable to make new plants every year from seed. The scales of healthy large bulbs, if removed and placed in moist sand, will form tiny bulbs in a few months and these looked after carefully, increase in size and flower

in three years. Some species as *L. sulphurianum* and *L. tigrinum* develop small bulbs in the axils of their leaves ; these bulbs drop off on ripening and, if sown and looked after with care, they flower in three years.

The following are some of the noteworthy species :—

L. longiflorum (The White Trumpet Lily) has a small bulb with slender stems, two feet high, carrying six to ten fragrant pretty white flowers about six inches long. The flowers are produced in February to March and they last a long time if cut. Native of Japan and China. Its variety *Harrisii*, which is well known as the Bermuda Lily has large bulbs, about ten inches in circumference, and produces several spikes of large white flowers. There are other varieties of *L. longiflorum* which are also handsome.

L. auratum (the Golden-rayed Lily) grows three to four feet high. bearing white and yellow flowers with orange spots. It is a native of Japan. Its varieties are also pretty.

L. giganteum is a Himalayan species growing as tall as ten feet with long handsome foliage and long tubular numerous white flowers, which are streaked with crimson on the outside. Flowers in August.

L. candidum is the beautiful common white Madonna Lily. Grows two to three feet high with white flowers.

L. sulphureum is a very grand lily with stems growing six to eight feet high with large cream-yellow flowers.

L. neilgherrense is a native of the Niligherri Hills.

It grows about three feet high and bears large trumpet-shaped pale yellow flowers, about eight inches long by five inches in expansion.

L. tigrinum (the Tiger Lily) is from Japan and it grows two to four feet high, bearing flowers which are deep orange-red, spotted dark purple.

And several others.

MIRABILIS

(Natural order. Nyctagineæ)

Mirabilis Jalapa, well known as the Marvel of Peru, is a tuberous rooted small herbaceous shrub, about three feet high, bearing in great profusion in the rainy season, brightly coloured flowers with coloured calyx having the appearance of corolla. Flowers are variously coloured, and funnel-shaped with a long tube and expanded mouth. They close at about 4 O'clock in the evening and open out in the morning and hence the popular name, Four-O'Clock-Flower. Plants are easily raised from seeds which are produced in plenty, and hence are grown as annuals, though perennials by nature and can be grown from old tubers. Regular supply of water and rich soil give best results. The plants can be grown effectively in borders, shrubberies or in pots. They die down in November to December; they have got well acclimated in this country and grow wild, spreading from self-sown seeds. *M. longiflora* bears long-tubed sweet-scented flowers.

MONTBRETIA

(Natural order. Iridaceæ)

Montbretias are allied to Tritonias and are very much grown like them. They are showy, hardy, summer-flowering, little bulbous plants from South Africa with Gladiolus-like foliage and flowers, rich and brilliantly coloured, borne on spikes, which are very useful for cutting for vase decoration. They thrive from medium to high elevations in open sunny borders in rich soil. They are best undisturbed for two or three years forming large clumps. Propagation is by division of clumps or from seed.

NARCISSUS

(Natural order. Amaryllidaceæ)

Genus of well-known bulbous plants, mostly natives of Western Europe, thriving only on hill stations, where they grow wild and bloom freely. Flowers are white or yellow in almost all the species but there are some orange-reds among the hybrids. They are solitary or clustered, several together, on their fluted stalks. The garden kinds are grown in good soil in beds, borders, and in pots. Light rich soil composed of sand, leaf-mould, well-decomposed manure, and loam in equal proportions suits them best. They are grown much in the same way as Hyacinthus. If bulbs are freely watered at the initial stages of growth, the plants run into leaf and bloom but poorly or not at all. They are

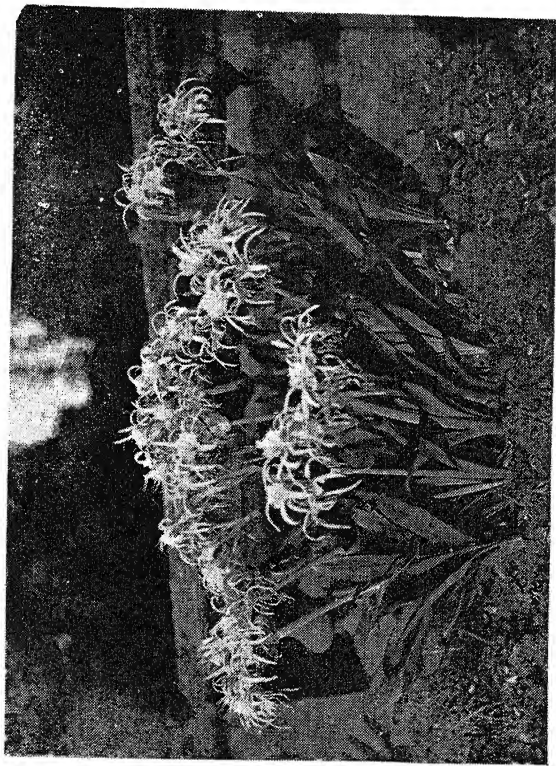
started growth in September or February, according to the season of particular kinds. Five bulbs may be planted in 10-inch pots one inch deep. In the ground, they may be planted two to three inches deep. Propagated from offsets or seeds. The bulbs form fresh roots under them, as soon as the foliage dies down and to prevent these being formed, they should be lifted when the leaves turn yellow and allowed to dry in a cool airy shed.

It is a great pity that these bulbs, as well as Jonquils and Daffodils, which are much esteemed and grown extensively in temperate climates cannot be grown in India, except in hill stations.

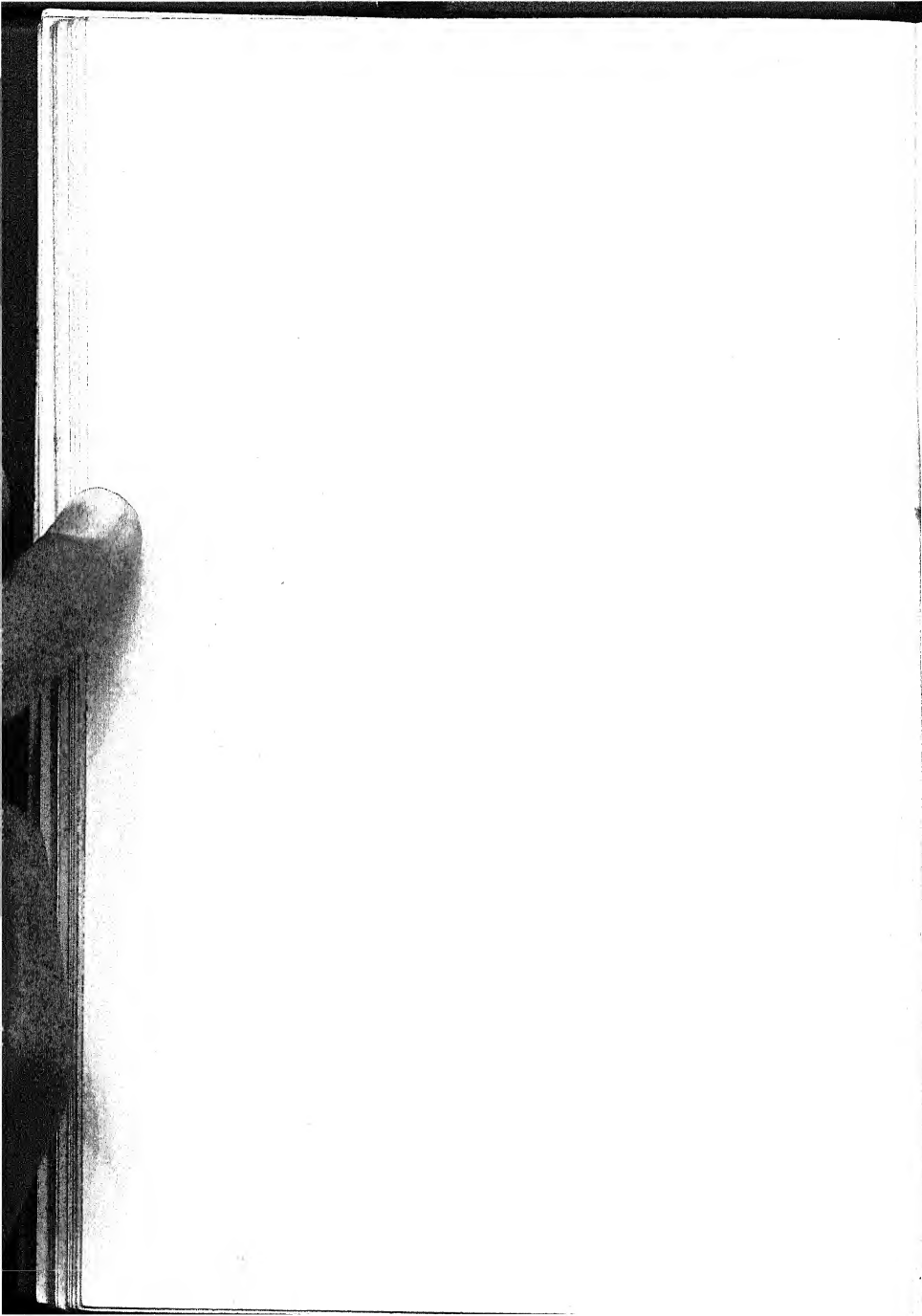
OXALIS

(Natural order. Geraniaceæ)

A large genus of 200 and more species of dwarf herbaceous plants with mostly tri-foliolate leaves and fleshy small bulbs or root-stocks. Some species are pretty and good for cultivation in gardens but several are weeds, spreading rapidly by means of self-sown seeds and bulbs, and are difficult to eradicate. Oxalis can be grown throughout India and they do not deteriorate from climatic conditions. The hybrids are grown in pots or on rockeries. Light rich soil and a moderate amount of shade are necessary. Every year, the bulbs should be divided and replanted, placing them two to three inches apart. Blooms are produced in the cold season and the plants die down by May to June, when the bulbs are rested and stored like Achimenes.



Group of *Pancratium*s



O. Bowieana bears large tri-foliate leaves and large rose-red flowers in umbels and is very desirable for pot culture.

O. rosea is also a handsome flowering species, with large rose or white flowers.

O. speciosa ; *O. grandiflora alba* ; *O. cuprea* are some other attractive species.

PANCRATIUM

(Natural order. Amaryllidaceæ)

Popularly known as the Spider Lily. Tunicated bulbous plants requiring little care to be bestowed upon them beyond planting them in beds or borders. They are grown in pots too. The foliage is handsome and evergreen and is composed of long broad leaves. Flowers are characterised by beautiful structures, known as the staminal cups, having the texture of petals and being toothed and fringed in a variety of ways ; the filaments growing out of the cup are long ; the segments of the perianth are usually long, slender, and gracefully recurved. The flowers are pure white in colour and are clustered in large showy panicles measuring over a foot across. They have a peculiar spider-like appearance, and hence, the common name, Spider-Lily. *Pancratiums* are moisture loving plants and they should not be kept dry at the roots. They bloom best if left undisturbed or when they are pot-bound. Propagated by offsets, which are separated and potted off in small pots.

POLYANTHES TUBEROSA

(Natural order. Amaryllidaceæ)

The tuberose is known as the *sughandharaja* in Canarese and Tamil. It is easily grown and propagated by offsets. Plants grow about six inches high with radical light green, narrow, arching, crowded leaves. The flowers are waxy-white, very sweet-scented, tubular, two to three inches long, single or double, and borne in pairs in lax spikes on flower-stalks which are about two feet tall. The spikes are useful for cutting for vase decoration and the blooms are also useful for making bouquets and button-holes. Cut away the old roots at the base of the bulbs, separate the offsets from the central large bulbs (see figure 14) and plant these large bulbs only for blooms. The smaller bulbs mature and bloom in course of time, if planted separately. Plant the large bulbs six inches apart in the ground covering them with an inch of good soil. For exhibition purposes, for pot-culture, plant five to six mature bulbs in 12-inch pots using a light rich compost. As tuberose are strong feeders, supply them with weak liquid manure prepared from guano or cow or horse-dung, once a week, during the period of vigorous growth when the flower-stalks are being pushed up. Trim away all old and unhealthy leaves. After flowering, the bulbs may be rested and planted at any time of the year. By successional planting, blooms can be had throughout the year.

RANUNCULUS

(Natural order. Ranunculaceæ)

The Butter-cup or the Crow-Foot is a very beautiful tuberous-rooted perennial of about six inches in growth and of good form bearing brilliant handsome flowers of white, crimson, yellow, carmine, and other colours. There are several strains, such as Turban, French, Italian, Persian, and Scotch. The individual flowers are often two inches across and they are beautifully imbricated and are as full and double as a Rose. *Ranunculus* cannot be grown at low elevations. Even in places about 3500 feet above the sea, they do not grow well. They need a shady situation and moist but well drained rich sandy soil. They are grown like *Anemones*, three bulbs being placed in a 9-inch pot and covered with a 2-inch layer of compost. The best time for planting the tubers is October. Seeds are best sown in January. While planting, the tubers are pressed down firmly, the claws downwards and the crowns upwards, and covered with sand and then with the compost. Watering is done by the edge of the pot and not on the foliage. The tubers are lifted after they have flowered when the leaves turn yellow; if left in the soil, they restart growth and die off. The roots are kept in a cool dry place after drying them in the shade. *Ranunculus* may be raised from seed or offsets. From seeds, they are grown like *Anemones*. The plants are subject to attacks of caterpillars, which are handpicked.

RICHARDIA

(Natural order. Aroideæ)

Richardias are popularly known as Callas or Arum Lilies. *Arum calla* or *Richardia Aethiopica* or *Richardia Africana*, as it is differently called, is a tuberous-rooted plant, well known to gardeners for more than a century; it is the hardiest species. It thrives with great success as a semi-aquatic plant on the margins of lakes and streams and is well suited for planting by the edge of water in water gardens; it is also a good pot plant, if given a moist treatment. It is a moisture-loving plant, with handsome foliage composed of large, arrow-headed, dark green, radical leaves. As in many other genera of the Arum family (Aroideæ), the true flowers are very small and inconspicuous and they are crowded in a spadix enclosed by a large and truly handsome spathe of a pure white colour. Rich light soil, good drainage, plenty of moisture, and shady situation are necessary for success in the cultivation of Callas. The plants die down in the cold season and come up again in March. Confine the roots in small pots or there will be rank foliage at the expense of flowers. If the bulbs are not large, put them in 6-inch pots; or, use 8-inch pots. At low elevations, the tubers do not bloom freely. Propagate by off-sets.

Richardia elliottiana bears pure yellow spathes and it is less common than the preceding species; the leaves also are highly decorative, being spotted white.

Richardia albo maculata is another handsome species, with very attractive pleasing green foliage marked with transparent blotches and spots of white, hardly in need of flowers, which are white, to enhance their beauty.

Callas are potted in October to November in the plains and in March to April on the hills and medium elevations.

TIGRIDIA

(Natural order. Iridaceæ)

Very interesting Mexican plants, with bulb-like corms bearing very peculiarly shaped gorgeously coloured flowers in summer. The plants have little foliage and are hence planted in clumps in borders to hide their naked stems. The individual flowers are shortlived, lasting only for a day; but good corms may yield a succession of blooms. Tigridias are difficult to grow and they are only suited for high elevations.

TRITOMA

See under *Kniphofia*

TRITONIA

See under *Montbretia*

WATSONIA

(Natural order. Iridaceæ)

Pretty genus of South African bulbous plants, one to one and a half feet high, allied to *Gladiolus* and grown

similarly. Flower spikes appear in the rainy season. *Watsonia* is a better bedding plant than *Gladiolus*, with longer duration of bloom. It requires rich sandy soil and needs protection from rains and frost. There are several effective species, all of them being suited only for high elevations.

ZEPHYRANTHES

(Natural order. Amaryllidaceæ)

Popularly known as Thunder-Lily, Zephyr-Flower or Flower of the West Wind. A class of very hardy really pretty little bulbous plants, four to six inches high, with fine shining grass-like foliage consisting of long and narrow-linear or semi-cylindric leaves; beautiful Lily-like flowers are borne singly on flower-stems, four to eight inches high, well above the foliage. The blooms are produced in great profusion after a shower of rain, if the bulbs are planted in clumps and not disturbed for a year or two. They do exceedingly well in well-drained sunny beds, borders or rockeries. Patches of them naturalised on lawns have a charming effect, the blooms peeping beautifully above the green verdure. *Zephyranthes* are useful for edging walks and paths; the plants suddenly burst into bloom in a mass, nearly three to four times a year, soon after the rains succeeding a spell of drought; if left undisturbed where they are, they bloom freely in masses, forming small colonies of themselves, by numerous offsets and self-sown seedlings.

The bulbs are planted four to five inches apart and two to three inches deep. In course of time, the offsets crowd round the old bulbs and fill the intervening space. There are several species with yellow, pink, rose, and white flowers. Hybrids of *Zephyranthes* with *Cooperia* (the White Evening Crocus), called the *Cooperanthes*, are more floriferous and exhibit greater variety in colours than *Zephyranthes*. The following species of *Zephyranthes* are worth noting:—

Z. candida, white flowers; grows four to eight inches;

Z. Atamasco, white flowers tinged with rose; grows six to nine inches; a large flowering species.

Z. Andersoni, yellow flowers flushed on the outside with red tint.

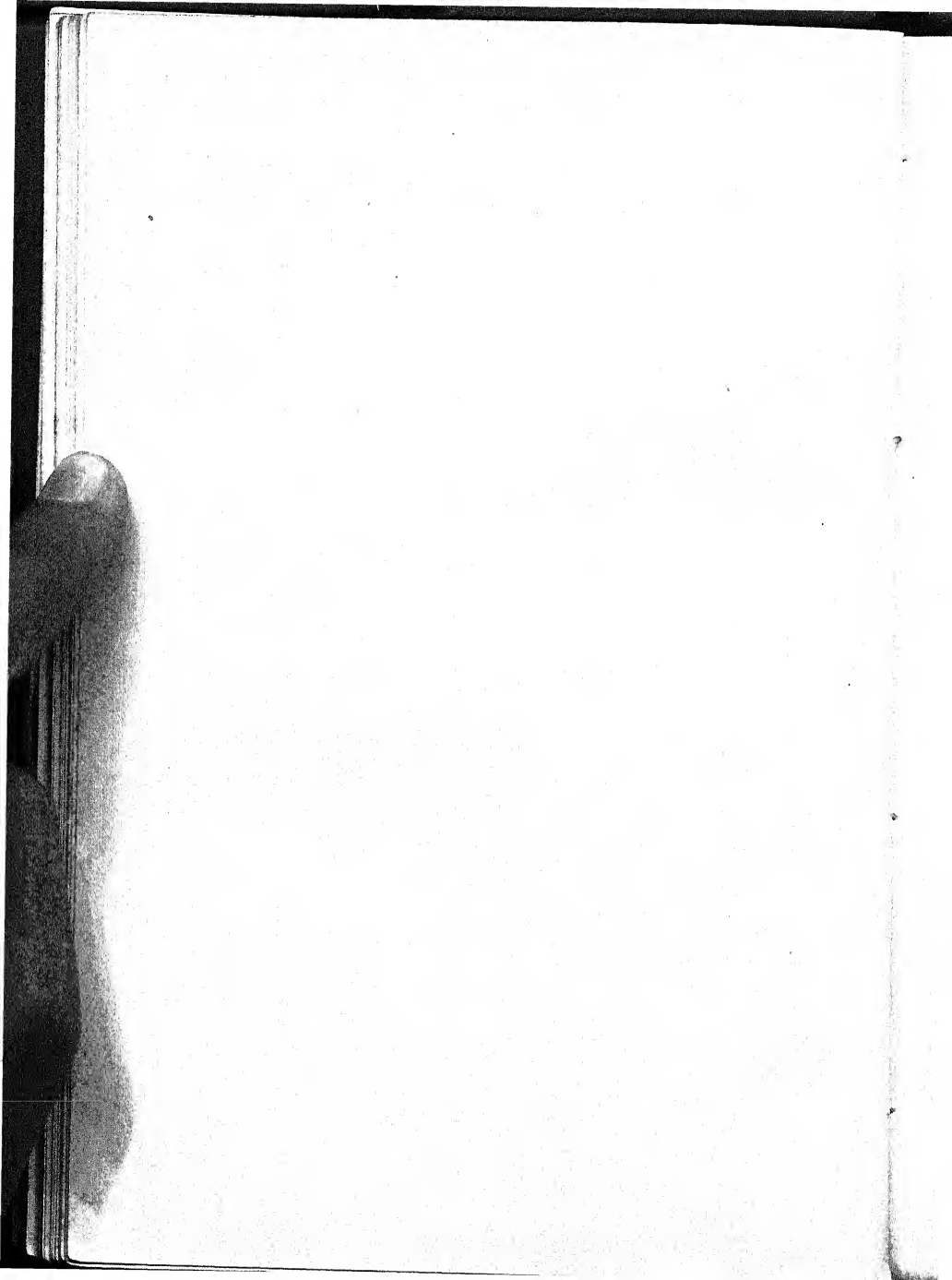
Z. sulphurea and *Z. aurea* bear yellow flowers.

Z. rosea and *Z. robusta* bear rose-coloured flowers.

Z. tubispatha is another white kind.

Z. carinata is a large rose-coloured variety.

Z. versicolor is variable with rose and white flowers.



CULTURAL NOTES

ON SELECT

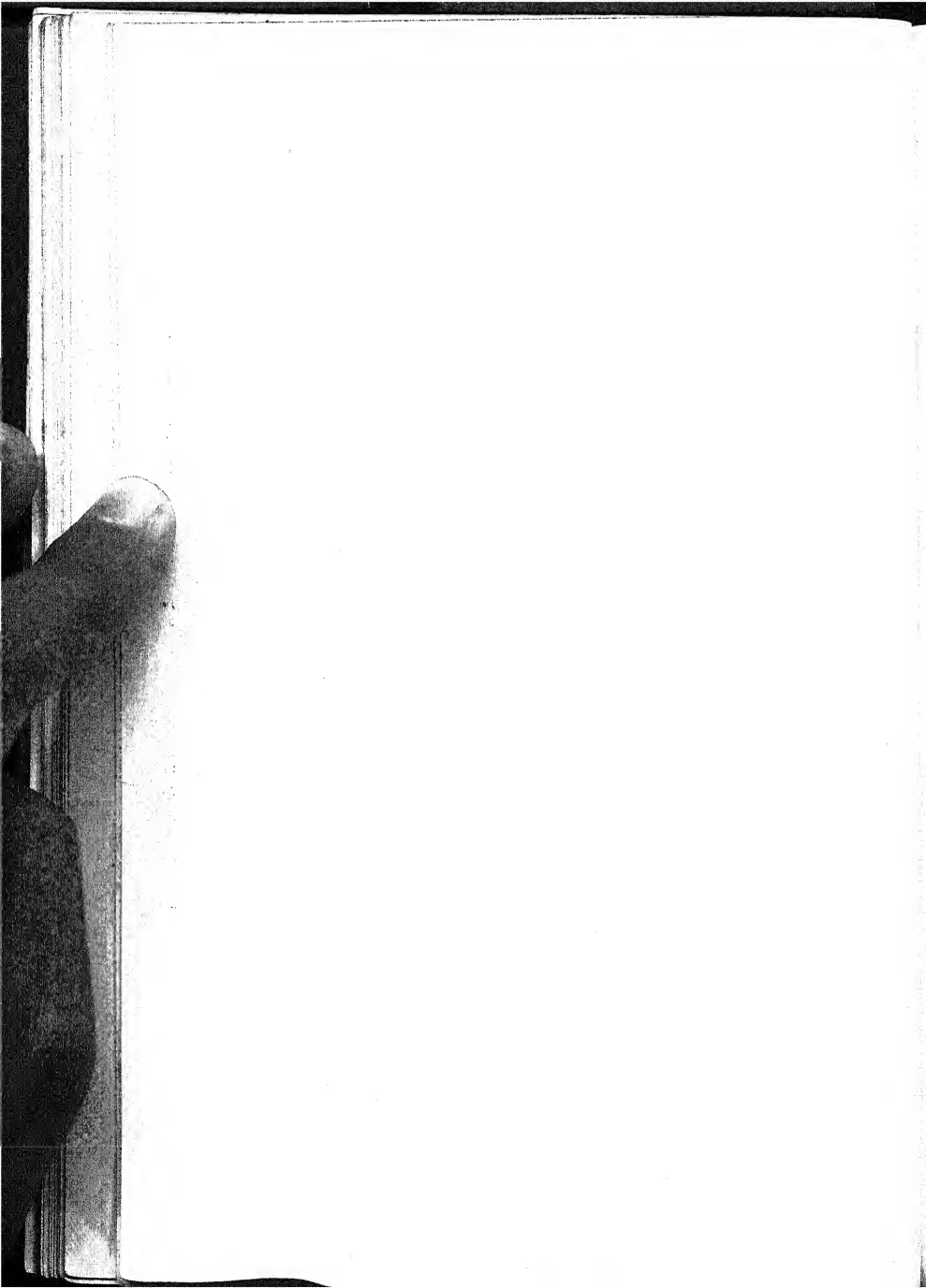
BULBOUS PLANTS GROWN

FOR THEIR HANDSOME FOLIAGES





Collection of Alocasias and Caladiums
(By courtesy of the Superintendent, Government Gardens, Bangalore)



*[The introductory remarks should be read with the
following cultural notes of particular plants
for complete information]*

ALOCASIA

(Natural order. Aroideæ)

Alocasias are considered in this book, because some species have tuberous and some rhizomatous roots and several of the species can safely be said to have a growing and a resting period like bulbous plants. Some species, though they are evergreen, do not grow actively in winter, and hence require careful attention to watering.

Alocasia is a genus of Aroids, very much allied to Colocasia and Caladium. It ranks high among ornamental foliage plants. The several species are perennial in habit and they are very useful for decoration of conservatories, plant-houses, and verandahs. The leaves of many species are large, coloured and variegated; some have a rich metallic lustre, while others are green or green and white with prominent veins and markings and blotches. The leaves are usually peltate (that is, shield-shaped, the peculiar insertion of the leaf-stalk on the underside, giving this appearance); in some species, they are nearly a yard long from top to bottom. The leaves are more or less oval-triangular in shape with a deep sinus at the base. The undersurface is generally

distinct in colour from the upper side. The leaf-stalks are beautifully marked and blotched in many species. The stem is thick, short, and densely marked with leaf-scars; it partakes of the character of tuberous or rhizomatous-rooted plants, most of the species having a distinct period of rest following a period of active growth.

Alocasias are easy of cultivation, thriving well in semi-shade or shade, in well-drained light soil. They are mostly grown in pots or on rockeries in shade gardens. The compost is made up of one part of leaf-mould, one part of sand, half part of loam or red earth, and half part of well-decomposed manure. The addition of a little lime rubbish and charcoal pieces helps to keep the soil sweet besides promoting drainage. During active growth, watering is done regularly and liberally and this is generally from April to November. Though several species are not deciduous, the water supply is reduced to them while not in active growth as they will rot away if supplied with too much water. Old plants cut back to the soil level or just a little above it, give rise to a number of fresh shoots rich with foliage. Propagation is done by cuttings of stem (node cuttings) or by tubers, or cuttings of the rhizomes. Some species can also be raised from seed. The inflorescence is a spadix enclosed by a spathe and it is unattractive. To encourage fine foliage, the flower is removed as soon as it appears. The following are a few noteworthy species of *Alocasia*:—

A. argyrea grows about three feet high making a

handsome plant with crowded foliage consisting of large leaves which are dark green with a silvery sheen.

A. cuprea has leaves of a dark metallic green colour with darker veins and ribs above and rich purple on the underside; the leaf-stalks are two feet or less long and the blades are about 18 by 12 inches and ovate-peltate.

A. Johnstonii presents a unique appearance. Its leaves are semi-erect, arrow-shaped and peltate, olive-green and prettily variegated and veined with bright rosy-red; the leaf-stalks are furnished at intervals with whorls of stiff spines; the stem is darkly mottled with bands of flesh colour just above the spines.

A. Jenningsii is a handsome species growing two to three feet with leaves, eight to ten inches long and nearly as much wide. The ground colour is a beautiful glaucous green and this is set off by oblong patches of almost black.

A. Lindenii is a noble species growing about two feet. It has broadly arrow-shaped leaves, which are green with yellow veins curving off from the pale yellow mid-rib and vanishing near the margin; the petioles are nearly white. This species is also known as *Xanthosoma Lindenii*.

A. macrorrhiza variegata is a sturdy species with large cordate leaves which are pale green with large portions of them blotched with creamy-white and white; some leaves may be fully white. A native of Ceylon; propagated by suckers or offsets.

A. Loweii grows about two feet high and it is very

attractive while in full growth. The leaves are cordate-sagittate, fourteen to sixteen inches in length, olive green with margins of white, and purple beneath.

A. metallica has large shield-like leaves, smooth and shining, the colour being deep olive green suffused with bronzy-red above, and underneath reddish brown.

A. Sanderiana is a very attractive species, a native of the Philippines growing about two feet high with arrow-shaped leaves with scalloped edges and broad prominent white margins and nerves.

A. Thibautiana is a native of Borneo, a pretty species growing three feet high with leaves about 2 feet by 18 inches, of deep olive green with silvery white nerves branching out from the mid-rib; the underside of leaves is purple in colour.

A. zebrina is a desirable species with light green leaves with long prominent leaf-stalks which are marked with zig-zag transverse dark bands and blotches.

Alocasia esculenta (called *senai kilangu* in Tamil and *Same gedde* in Canarese) is large growing and distinctly tuberous-rooted. The leaves are very large and dark green. The fleshy hard tubers are edible and hence this species is largely grown by market gardeners.

ALPINIA

(Natural order. Zingiberaceæ)

Large genus of handsome foliage plants, easily raised by division of the fleshy rhizomatous roots which have

the smell and taste of Ginger. Rich light soil, liberal supply of water during growth and plenty of root-space are necessary. Flowers are borne at the ends of the shoots and are not much. The plants are useful for mass effect if planted by swampy corners and in low ground.

A. mutica bears white flowers with yellow tip.

A. nutans bears sweet-scented pink and yellow flowers in drooping racemes. A native of India; it is suited for cultivation in swamps.

A. vittata has stems nearly a yard long with lance-shaped leaves, which are pale green with stripes of creamy white. A handsome foliage plant.

A. Sanderæ is a very popular pot plant, a species similar and superior to *A. vittata*. Used for decoration of plant houses. If the soil is rich, variegations do not develop well.

ANTHERICUM

(Natural order. Liliaceæ)

Dense foliated herbs, with mostly fleshy, grassy, long and narrow leaves, which are gracefully recurved, springing from the short root-stock, which is fleshy and tuberous, the spindle-shaped roots being borne in a cluster. Loose panicles of flowers are borne from the latter. The variegated varieties are very handsome and they are largely used in carpet-bedding, for edging for culture in vases, and baskets in shade. Grown in pots,

they are useful for decoration of conservatories. Anthericums require a sandy loamy soil and liberal supply of water and thrive in shade and semi-shade. Very often, the ripe flower-stalks carry young plants with fully developed root system, and these may be straight-away potted in 5-inch pots.

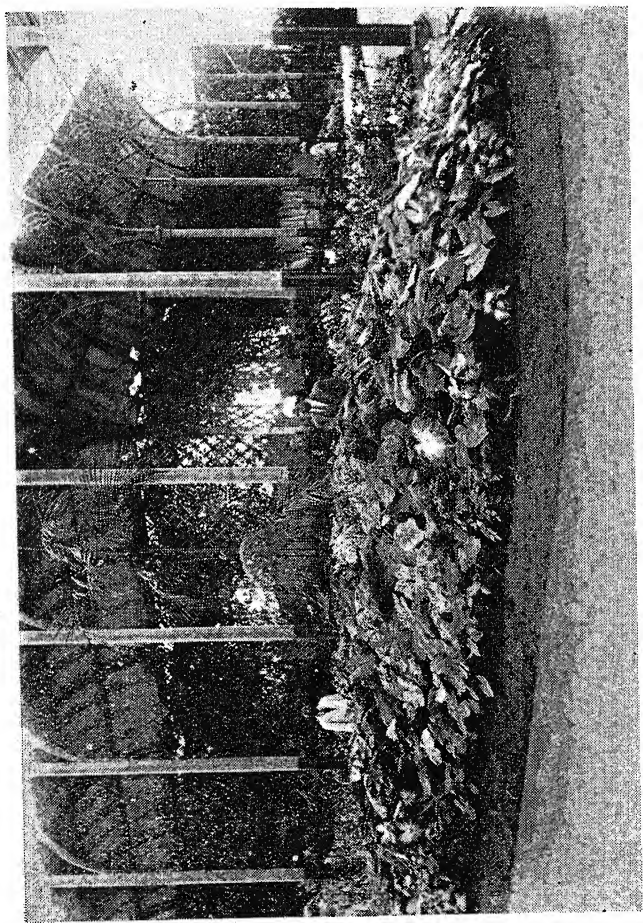
A. variegatum (*Chlorophytum elatum variegatum*) bears very handsome foliage of light-green leaves striped with white on the margin. A very attractive useful plant, thriving above 2000 feet above the sea.

A. Liliago (St. Bernard's Lily) thrives in rich well-drained soil. Leaves are grassy, recurved, tufted, long, narrow and channelled. Flowers are white and are borne in panicles.

CALADIUM

(Natural order. Aroideæ)

Large genus of cormous aroids of South American origin, grown for the richness of colour and beauty of foliage. They are very popular plants grown for decorating verandahs, dwelling rooms, corridors, conservatories, or plant-houses. They are usually grown in pots but they would do quite as well in the ground. It is impossible to adequately describe the varied hues of the leaves, which are strikingly ornamental. They are broadly arrow-shaped, peltate, of a membranous texture, and vary in size from a few inches to a couple of feet. Colours vary from pure white to deep crimson, purple,



Collection of Caladiums—(By courtesy of the Superintendent, Government Gardens, Bangalore)

bronze, and pink and the leaves are conspicuously blotched and splashed with distinct colours in the several kinds. Almost all the species of *Caladiums* are deciduous, beginning growth in April to May and dying down for rest in October to November. But, at low elevations, as in Madras, *Caladiums* are started growth in October. Light, open, rich soil suits them well and the compost may be made up of equal parts of loam (red earth), sand, leaf-mould, and manure. Some charcoal pieces may be added to the compost to keep it from turning sour. Start the dormant corm by keeping it in moist sand for about a week. Put one large corm or three small ones into a 9-inch pot. Smaller ones may be planted in 6-inch pots singly. Leave the crowns of the corms exposed. Water sparingly till the leaf-sheath is about three inches high; then, gradually increase the supply of water. Remove the flower, which usually appears before the foliage. Stake the plants when they are sufficiently large. Give them a sheltered situation where they are not exposed to severe sun. In very shady situations, colours are not well developed. Supply weak liquid manure (cow-dung water) once a week. After the growing period, the foliage loses its brightness. Reduce the supply of water gradually till the leaves completely die back. Stop watering and turn down the pots; when soil is dry take out the corms for storing them. Propagate from young growths that are thrown up from the crown of

the corms; cut them up into as many pieces as there are buds.

There are innumerable hybrids which are offered for sale by several firms.

The following two species are valuable as edging plants:—

C. argyrites (*C. Humboldtii*) is a dwarf type, about a foot high; leaves are small, green and white; suited for edging and ribbon borders.

C. bicolor grows about a foot high. Leaves are bright pink with green borders and are showy. Suitable for edging.

CALATHEA

See under *Maranta*

CHLOROPHYTUM

See under *Anthericum*

COLOCASIA

(Natural order. Aroidæ)

Plants allied to *Caladium* and grown similarly; *C. giganteum* and *C. antiquorum* are very large growing species, which are usually cultivated. The leaves are cordate and shield-shaped, nearly a yard long and the plants are striking and suited for massing in shade gardens. *C. antiquorum esculentum* produces large leaves and tubers which are edible.

HELICONIA

(Natural order. Scitamineæ)

Foliage plants allied to *Musa* or Plantain, with large striking leaves, beautifully marked and coloured in several species. *Heliconias* are grown in large pots like *Cannas* and they are useful for decorating conservatories and for growing in beds in shade gardens. Protection from sun and liberal supply of water during growth are necessary. Watering is done sparingly from November to March, when the plants do not actively grow. The flower-stalks in the flowering species are removed, as they appear. Moist atmosphere and syringing improve the foliage. Propagation is by division of the rhizomes as in *Canna*. The pieces of roots are started in small pots and then transferred to bigger pots. Final potting is done in 15-inch pots, in which they make quite a good show. The following are a few commendable species :—

H. aureo striata (golden striped) grows three to four feet high, with large handsome broad leaves, striated with yellowish parallel transverse lines ; the stem is also striated with yellow and green ; a truly noble species.

H. illustris grows three to four feet ; the leaves are large, coppery, striated with bright pink lines. Also a very handsome species.

H. rubra grows three to four feet high, with large, brown and bronze leaves. A very desirable species.

H. insignis bears bright bronzy green leaves, which are long, narrow and wavy.

MARANTA

(Natural order. Scitamineæ)

Marantas and Calatheas are important members of the Ginger family. They are extensive genera of tropical plants, mostly natives of Brazil, grown for their ornamental foliage. The leaves are egg or lance or heart-shaped, roundish or oblong, and variously marked with shades of green, red, brown, yellow and white on the upper side and coloured grey or purple or rose below. Roots are creeping underground and rhizomatous like those of Ginger and propagation is mainly by division of rhizomes. Some species are deciduous and have a definite resting period which is generally from November to end of February or so. In horticulture, Maranta and Calathea are confused with each other and both are included under the title of Maranta.

Marantas are easily grown, either in the ground or in pots. They require shade and are hence grown in shade gardens and conservatories or plant-houses. Protection from strong sunshine is very essential, as it destroys and makes the foliage unsightly. Liberal watering and perfect drainage of the soil need particular attention. Syringing the foliage with clear water keeps off insect pests and it is also helpful to maintain a humid atmosphere, which the plants need. The soil is made up of a mixture of equal parts of loam, sand leaf-mould, and well-rotten manure. Addition of some peat to the compost is very helpful for healthy

growth in several delicate species. Artificial manures are to be avoided in the cultivation of Marantas. In February to March, the clumps are split up, the roots are washed free of soil, the healthy parts selected and the pieces containing buds on them are potted. Small roots may be started growth in 6-inch pots and the plants may be shifted to larger pots, as growth progresses. The deciduous kinds require no water during rest. The evergreen kinds, too, do not need much water during winter months when the plants do not make active growth. Repotting or replanting is done annually. A number of species do not need very firm potting.

The following are a few noteworthy species:—*M. amabilis*, *M. arundinacea variegata*, *M. bicolor*, *M. Devosiana*, *M. musaica*, *M. Leitzii*, *M. Massangeana* and *M. Makoyana*. *Maranta arundinacea* is the Arrow Root Plant. It has no ornamental value but it is economically important, being grown extensively for its roots from which the starch, known as Arrow Root, is extracted.

Calatheas are as mentioned above confused with Marantas and the former may be distinguished by their short globose flower heads.

The following are a few noteworthy species of Calathea:—*C. argyrophylla*, *C. cannaefolia*, *C. illustris*, *C. leopardina*, *C. Lindeniana*, *C. medio-picta*, *C. roseo-picta*, *C. princeps*, *C. Sanderiana*, *C. tigrina*, *C. Veitchiana* and *C. zebrina*.

SCHISMATOGLOTTIS

(Natural order. Aroideæ)

Dwarf ornamental foliage plants noted for their variegated leaves, which are oblong or heart-shaped, green or striped with silvery grey, purple or yellow, and spring from the rhizomes. Shade, moisture, abundance of water, and well-drained soil composed of 1 part of leaf-mould, 1 part of sand, 1 part of loam, $\frac{1}{4}$ part of charcoal pieces, and $\frac{1}{2}$ part of peat, are necessary. Propagation is by division of rhizomes in June to July. The following species are recommended :—

S. picta. Grows about a foot high; leaves are ovate-cordate, dark shining green, having feathered greyish band running down the middle.

S. siamensis grows a foot high; leaves are ovate-acuminate, glossy green spotted with white. A truly decorative plant.

S. variegata bears bright green leaves, which are irregularly blotched with pale yellow green and creamy white.

ZINGIBER DARCEYI

(Natural order. Scitamineæ)

Variegated Ginger. Rhizomatous-rooted plant, two to two and half feet high, with leaves and stem variegated green and white like *Alpinia vittata*. Propagation is by division of rhizomes. Growing season is from April to November and the resting period from December to March.

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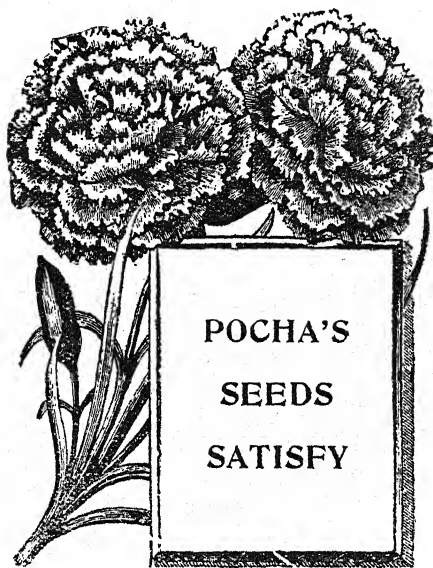
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